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FOR

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AMERICAN PHILOSOPHICAL SOCIETY,

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VOL. XXIX. JANUARY TO JUNE, 1891. No. 135.

Vocabularies from the Musquito Coast.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, March 6, 1891.*)

Through the kindness of the Rev. W. Siebärger, a missionary of the United Brethren, now resident on the Musquito coast, I have obtained several new vocabularies from that region, which offer points of interest to the ethnologist.

The most important of these is a list of words from the language of the Ramas tribe, the first and only specimen of their tongue that I have encountered. These people live on a small island in Blewfield lagoon. They number at present about two hundred and fifty souls, all of whom have been converted to Christianity, and all of them are able to speak and read English except a few very old persons. Their native tongue is rapidly disappearing, and in a few years, probably, no one will be left able to use it fluently and correctly.

In physique they are described as large and strongly built; in temperament, submissive and teachable.

Their language has always been reported as wholly different from that of the Musquito Indians, who occupy the adjacent mainland, and this is shown to be correct by the specimen sent me. It bears, in fact, no relation to any other tongue along the Musquito coast. It does not, however, stand alone, constituting an independent stock, but is clearly a branch, not very remote, of a family of languages once spoken near Chiriqui lagoon, and thence across to the Pacific, or nearly that far.

To this stock I have, in my classification of American languages

assigned the name "Changuina," from its principal member, the Changuinas, who resided on the river of that name flowing into Chiriqui lagoon It is said that some few villages of the stock may still be found about the headwaters of this stream.

My chief source of information about this family is derived from the small work of A. L. Pinart, published in Paris last year, entitled *Vocabulario Castellano-Dorasque, Dialectos Chumulu, Gualaca y Changuina* M Pinart knew of no members of the stock north of the Chiriqui lagoon, though Blewfields is more than two hundred miles to the north of it

The following is the list of the words sent me The orthography is German

	RAMA.		RAMA.
Man,	*nikikna,*	Tongue,	*kup.*
Woman,	*kuma*	Tooth,	*siik.*
Sun,	*nunik*	Hand,	*kwik.*
Moon,	*tukan*	Foot,	*kaat*
Fire,	*abung*	House,	*kau.*
Water,	*sii.*	1,	*saiming.*
Head,	*kiing*	2,	*puk sak.*
Eye,	*up.*	3,	*pang sak.*
Ear,	*kuka.*	4,	*kun kun baiso*
Mouth,	*kaka.*	5,	*kwik aslar*
Nose,	*tsik.*		

Of these the subjoined present more or less distinct Changuina analogies:

	RAMA.	CHANGUINA
Sun,	*nunik,*	*kolib-u*
Fire,	*abung,*	*kebug-ol* (fire-brand)
Water,	*sii,*	*si.*
Head,	*kiing,*	*kin-nauma.*
Ear,	*kuka,*	*kuga*
Mouth,	*kaka,*	*kaga.*
Nose,	*tsik,*	*Bakai*
Tongue,	*kup,*	*kuba.*
Tooth,	*siik,*	*su.*
Hand,	*kwik,*	*kula, kuluk*
House,	*kau,*	*ku.*
One,	*saiming,*	*umai.*

The words for man and woman, *nik-ikna* and *ku ma*, may have been borrowed from the Musquito, *wa-ikna* and *ma-iren.*

The numerals in the Changuina stock appear not to have been

well defined, as they differ in all three dialects. The Changuina proper helps itself out with the Spanish *umai*, one; *umai-dos*, two, *umai-tres*, three. The Gualaca dialect has *ku-e*, one, *ku-mai*, two, *ku-mas*, three. In both, "five" is "*kul-male*," a hand, which corresponds to the Rama *kwik-astar*.

The Rama words for "two" and "three," *puk sak*, *pang sak*, belong to a series of numerals which had an extensive adoption by several diverse families in Guatemala and Costa Rica, and probably are of South American origin. They are distinctly traceable to the Cuna or Darien language, in which we have, 2, *pok'-ua*, 3, *pak'-ua*, and these reappear in the Guatuso of Nicaragua This is evidence that the Ramas reached their island after they had adopted these Cuna words. This was probably after the Conquest. We know that in 1674–81, the Governor of Costa Rica, Don Juan Francisco Saenz Vasquez, marched against the Changuinas on account of their turbulent character, and severely punished them. Perhaps at this time the Ramas entered their canoes and sought refuge along the coast, far to the north of their ancient seats.

My informant adds a few words of the Cuna or San Blas language, picked up by him on the coast, as follows.

	San Blas.		San Blas.
Man,	*tule, sirudi*.	Foot,	*naga*.
Woman,	*hoam*.	1,	*Luenokikua*.
Sun,	*tatu*	2,	*pogua*
Moon,	*nu*	3,	*pagua*.
Eye,	*ibia*	4,	*pakawa*
Ear,	*auar*.	5,	*atali*.
Hand,	*aregena*		

Comparing this with the *Vocabulario Castellano-Cuna*, of A L. Pinart (Paris, 1890), it appears to be a tolerably pure dialect of the tongue.

Mr Siebärger also furnishes a vocabulary from the Twaka Indians. These natives live in a number of scattered hamlets about the headwaters of the Tungla or Princeapula rivers. The latter name is a compound of "Prinzo," the name of a tribe, and the Musquito *awala*, river.

From an inspection of the list, it is clear that they belong to the extensive Ulva stock, as I have assigned them from previous evidence in my classification of "The American Race." *

* *The American Race: A Linguistic Classification and Ethnographic Description of the Native Tribes of North and South America* (New York, 1891).

	Twaka.		Twaka.
Man,	*all.*	Tongue,	*taki.*
Men,	*mui.*	Hand,	*tinghi,* or *tingma.*
Woman,	*yall, wana.*	Foot,	*kallni.*
Sun,	*ma.*	House,	*honi.*
Moon,	*waiku.*	Hill,	*assam.*
Star,	*yalla.*	1,	*as.*
Earth,	*sau.*	2,	*bo.*
Sea,	*kuma.*	3,	*bass*
Fire,	*ku.*	4,	*arewako.*
Water,	*wass*	5,	*singka.*
Head,	*tunuk.*	6,	*tiesko as.*
Eye,	*makpa.*	7,	*tiesko-bo.*
Ear,	*tappan*	8,	*tiesko-bass.*
Nose,	*nanglak.*	9,	*tiesko-arewaka.*
Tooth,	*unnak.*	10,	*sallap.*
Mouth,	*malikpus.*		

The word *tiesko* in the numerals 6, 7, 8, 9, is explained as a form of *tingki*, "hand." The numeral for "five," *singka*, sounds suspiciously like the Spanish *cinco*, but I find it also in other Ulva dialects. For "twenty" the Twaka expression is *mui aslui*, "the man one time," *i e*, all the fingers and toes counted at once

Their expression of welcome, "How are you?" is *parrasta*, which explains the name of the Parrastahs, a tribe on the Rio Mico, belonging to the Ulva stock.

The plural suffix is *balna*.

Their term for God, or the Supreme Deity, is *Ma papangki*, "Sun-father," which indicates that they are, or were, sun worshipers.

The Twakas locate the seat of man's life and emotions, not in the heart, as most nations, but in the liver, and they have in common use such expressions as:

tasing sauram,	liver split = angry
tasing pini,	liver white = kind.
tasing sana,	liver black = unkind

In this they differ from their neighbors, the Musquitos, who employ in such expressions the word *kupia*, heart.

On a New Species of Atalapha.

By Harrison Allen, M.D.

(Read before the American Philosophical Society, January 16, 1891.)

ATALAPHA INSULARIS, sp. nov.

Ears rounded much smaller than head. The internal basal lobe longer than broad, and without posterior projection. The external basal lobe longer than high, without notch at the base anteriorly. The hem occupying notch is half the height of the auricle and is ample. The tragus is coarsely crenulate on the outer border, slightly narrowed at the tip, which is not turned forward. The external surface is without a trace of ridge, and the notch at the base above the small basal lobe without a tubercle. Snout and lower lip quite as in other species of the genus, except that the chin-plate is somewhat wider.

Skull with groove on centre of face vertex continuous with the anterior nasal aperture. Sagittal temporal ridge sinuate. The first upper premolar exceedingly minute, scarcely half the size of the corresponding tooth in other species; it can with difficulty be seen even with the aid of a lens. The lower premolars are nearer of a size than is the case in other species, the first being fully half the size of the second. The third lower incisor is rounded, minute, and without cuspules.

The membranes are much as in *A. noveboracensis*, but the terminal phalanx of the fifth finger is longer, and ends with a free end on the margin of the endopatagium. The membranes are attached to the foot at a point midway between ankle and the base of the toes.

The prevalent color of the hair is dark chestnut above, but lighter below. The base on the body is everywhere black, and the shafts buff. No ashy tips are anywhere seen. The ventral half of the side of neck is white. The hair is scanty along the ventral surface of the forearm and the proximal ends of the last three metacarpals. The dorsum of the interfemoral membrane is furred only at the basal third. The remaining characters as in *A. noveboracensis*.

This species is readily distinguished by the shape and small size of the ear and tragus, by the attachment of the wing-membrane to the foot, and by the peculiarities of the premolars in both jaws, as well as those of the third lower incisors. It agrees with a southern variety of *A. noveboracensis* (*A. frantzii*) in the partially free dorsal surface of the interfemoral membrane.

The specimen was forwarded to me by Mr. J. G. Cooper, of the California Academy of Natural Science, in a bottle containing an example of *A. noveboracensis*, and it resembles this form so closely in coloration that at first I mistook it for an immature example of the species last named.

The specimen is in poor condition After decomposition had set in, it had been preserved for a long time in strong alcohol.

Habitat unknown, but it is probably Southern California.

Measurements.

Head and body (from crown of head to base of tail)		88	mm.
Length of arm		23	"
" forearm		37	"
1st digit	Length of first metacarpal bone	9	"
	" first phalanx	4	"
2d digit.	Length of second metacarpal bone	40	"
	" first phalanx	6	"
3d digit	Length of third metacarpal bone	40	"
	" first phalanx	14	"
	" second phalanx	15	"
	" third phalanx	2½	"
4th digit	Length of fourth metacarpal bone	38	"
	" first phalanx	10	"
	" second phalanx	8	"
5th digit	Length of fifth metacarpal bone	33	"
	" first phalanx	7	"
	" second phalanx	7	"
Length of head		13	"
Height of ear from head		4	"
" " base of external lobe to tip		6	"
" tragus		8	"
Length of thigh		14	"
" leg		16	"
" foot		6	"
" tail		39	"
Width 2d interdigital interspace		9	"
" 3d " "		10	"
" 4th " "		28	"
Difference between 3d and 4th interspace		18	"
Length of forearm		37	"

Thus the manal formula is 9–10–28–37, the difference between the third and fourth interdigital interspace 18, and is much the same as in *A noveboracensis*.

The measurements of the body and of the metacarpals are within the range of those which can be made on specimens of *A noveboracensis*. The second phalanx of the third finger is longer than the second, the second phalanx of the fourth finger is much shorter than the first; the second phalanx of the fifth finger is of the same length as the first. In these respects the measurements are in contrast with those of *A. novebora-*

sensis. The thigh is shorter than the leg, while both are smaller than in the species named. The foot is shorter, while the tail is slightly longer.

Atalapha is the most aberrant of any of the genera of the Vespertilionidæ, as this family is at present defined. It presents features in common with the Emballonuridæ, the Molossi and the Phyllostomidæ. These remarks are appropriate at this place, since in *A. teliotis* the general plan of the ear is as in Emballonuridæ; the shape of the wing, especially as to the strength of the first metacarpal bone, the shortness of the fifth metacarpal bone as compared to others of its series, the rigidity of the phalanges of the fifth digit, the arrangement of the lines in the fourth interdigital space, the flexibility of the lips, the great height of the internal tuberosity and of the length of the epicondyle of the humerus, the reverted distal ulnar rudiment, the posterior deviation of the coracoid process, the presence of a distinct lateral lobe to the cerebellum, the number of the upper incisors (being restricted to two), and the general shape of the wing are as in Molossi, while the complete tympanic bone (forming a ring at the upper margin), the pisiform bone being palmad and articulating with the fifth metacarpal bone, the palmad distinctness of the metacarpal bones, the shapes and relative proportions of the ectoturbinals, the presence of numerous vertical raised muscle bands on the endopatagium, the angle of the lower jaw not being deflected, but remaining in axial line with that of the horizontal ramus, the genus resemble the true Phyllostomidæ.

Notes on Hebrew Phonetics. By J. Cheston Morris, A.M., M.D.

(Read before the American Philosophical Society, March 6, 1891.)

It might seem extremely rash for one whose acquaintance with Hebrew scarcely extends to a knowledge of its letters to offer any observations upon them in the presence of those who have made an exhaustive study of the subject, yet I do so, as thinking that one who occupies "the room of the unlearned," and is looking at the matter from a distance rather than from the dust-obscured atmosphere of the conflict of opinions, may offer some hints which may prove of value, even though they may not be wholly new.

In commencing the study of Hebrew characters, one is struck with two facts. 1. That there is said to be no character representing a pure vowel sound. This, I believe, is not the case with any other known alphabet. 2. That a change was made during the Babylonian captivity of the Jews, substituting the present square characters for the more ancient form. Let us inquire, first, why this was probably done. At this time the sacred records were subjected to inspection of their conquerors, containing, as they certainly did, many things which would be more or less offensive to them, and calculated to cast ridicule if not bring persecution upon the ex-

lies. What more natural than for those who had charge of these records to endeavor to conceal their contents by such a veil as opportunity afforded, viz., that the ancient phonetic value of the letters had been lost and the meaning of the words so obscured that only those initiated by long study of the Jewish sacred mysteries and traditions could read them? In this way we have accounted for the rise of the school of the Talmudists, the study of the Mishna and Gemara, and the origin of the Kabbala. No word was to be pronounced as written; it had an inscrutable meaning only to be learned by the initiated and transmitted by the use of points added to the letters. Add to this the inherent difficulty of representing the sounds of any people in the vocabulary of another race; as instances of this, take the substitution of "l" for "r" by the Chinese in learning English, or the difficulty a Frenchman or German has in acquiring our "th," or the Greek θ, or, as more to the point, the substitution by the uneducated German Jew of "sh" for pure "s." There is something in the physical structure of the vocal organs of each race which is reflected in the vocables used by it. In the Hebrew race as met with to day this ringing nasal character strikes us all forcibly.

After these introductory thoughts, we are struck with the fact that one of their Hebrew letters, the ע, *ngain*, is so variously pronounced as to make one seriously question its true phonetic value. Its place in the order of the alphabet, as compared with the Phœnician and Greek, is that of the Greek *omicron*, its form in Phœnician and in the old Samaritan is o. In many Hebrew dictionaries this value is given it. Take, again, the ו, *vau*, its place that of the Greek F, *digamma*, its phonetic value that of the Latin v, or English ou. May not our double u, w, represent this, as well as the German v, *fow*? The sound of ק, *quof*, is lost to Western languages, except so far as represented by *q*, to which we add a *u* to make it vocable to us. The letters ס *samech*, and ש, *shin*, are represented by the Greek *σ*, *sigma*, and ξ, *xi*, but are found in an inverted order in the alphabet. [The confusion between these letters goes back to a far earlier period when we find two of the Hebrew tribes disputing over Shibboleth or Sibboleth.]

But the very first letter is a vocable which in all other alphabets is considered a pure vowel sound, a, the fifth, *he*, is another, ĕ, the sixth, *chayd*, is ā, or eh, the tenth, *yod*, is i, *iota*; and, as above, *vau* = ou, or u (or sometimes f or v), and *ngain* = o. We have thus all our usual vowel sounds except y, which we know in French as *ygrec*, and substitute usually for the Greek *upsilon*. In Hebrew we have two sibilants, *sain* and *tsaddi*, the latter of which occupies the alphabetical position in Greek of *upsilon*. If we now try to substitute in Hebrew, as ordinarily written, the above values for the letters, we shall find we have a perfectly vocable language. The names of men and places are given not very differently from our modern pronunciation of them as elucidated by the pointed Hebrew, when allowance is made for the difference due, as above stated, to racial intonation.

In some instances, two or three consonants are found together, but these may be regarded as familiar abbreviations for well known words, just as D. L. W means for us Delaware, Lackawanna and Western R. R., etc. In this way we may find that the Hebrew is really no exception as regards the presence of characters indicating pure vowel sounds, and, indeed, we have the authority of Josephus for the statement that it does. Chief among the words whose pronunciation was to be hidden was the name of the Deity—it was forbidden—and many, long, and bitter have been the controversies as to the true pronunciation of יהוה, *yod, hay, vau, hay*. Josephus says it was composed of *four* vowels.* He was a priest, and also well versed in Greek and Roman literature, and we may well accept his statement as reflecting the best learning of his times on Jewish matters. It seems to me that this ought to settle the question.

As to the consequences which would follow from such a view, I must leave them to those more competent to follow them out. It seems, however, to me that we would thus have better opportunities of comparing the Hebrew sacred records with those of all other ancient nations, and of clearing up much obscurity in ancient history and geography.

I would therefore suggest the following phonetic values:

א	$= \alpha =$ a	ל	$= \lambda =$ l
ב	$= \beta =$ b	כ ם final	$= \mu =$ m
ג	$= \gamma =$ g	נ ן final	$= \nu =$ n
ד	$= \delta =$ d	ס	$= \sigma =$ s
ה	$= \epsilon =$ ĕ	ע	$= o =$ o
ו	$= F =$ f or vow or ou or u	פ ף final	$= \pi =$ p
		צ, ץ final	$= \upsilon =$ y
ז	$= \zeta =$ z	ק	$= \quad =$ q
ח	$= \eta =$ ē or $\chi =$ ch	ר	$= \rho =$ r
ט	$= \theta =$ th	ש	$= \xi =$ x
י	$= \iota =$ i	ת	$= \tau =$ t
כ ך final $= \kappa =$ k			

And illustrate by

AN ATTEMPTED TRANSLITERATION OF GENESIS X

ch ch ch
1. v ale tuldt bni nē xm em v ipt v iuldu lem bnim aēr embul
Noah Sham Ham Japheth

v
2. bni ipt gmr v mgug v mdi v iun v tbl v mxk v tiis
Japheth Gomer Magog Madai Javan Tubal Meschech Tiras

* See Josephus, "Wars of the Jews," Book v, Ch. v, 7.

3. v bnl gmer axknz v ript v tgrmo
Gomer Ashkenaz Riphath Togarmah

v
4. v bnl lun allxe v trxlx ktlm v ddnlm
Javan Elisha Tarshish Kittim Dodanim

ch
5 male nprdu all ogulm barytm alx llxuu lmxpëtm bgulom

ch v ?
6 v bnl ëm kux v myrlm v puth v knon
Ham Cush Mizraim Phut Canaan

ch
7 v bnl kux sba v ëvlle v sbte v rome v sbtka v bnl rome xba v ddn
Cush Sheba Havilah Sabtah Raamah Sabtechah Raamah Sheba Dedan

ch
8. v kux lld at-nmrd eva eël lelut gbr bary
Cush Nimrod

9 eva-ele gbr yld lpnl leve ol kn lamr knmrd gbur yid lpnl leve
Jehovah Nimrod Jehovah

10 v tel raxlt mmlktu bbl v ark v akd v klne bary xnor
Babel Erech Accad Calneh Shinar

ch ch
11 mn-eary eeva lya axur v ibn at ninve v at rëbt olr v at klë
Asshur Nineveh Rehoboth Calah

ch
12 v at rsn bin ninve v bin klë eva eolr egdle
Resen Nineveh Calah

ch
13. v myrlm lld at ludlm v at-onmlm v at-lehbim v at nptëlm
Mizraim Ludim Anamim Lehabim Naphtuhim

ch
14 v at ptrslm v at-kslëlm axr lyav mxm plxtlm v at kptrlm
Pathrusim Casluhim Philistim Caphtorim

z ch
15 v knon lld at-yidn bkru v at ët
Canaan Sidon Heth

16. v at-ebusl v at amrl v at egrgxl
Jebusite Amorite Ghirgashite

ch
17 v at-eëvi v at eorql v at exlnl
Hivite Arkite Sinite

ch ch ch
18. v at aruadl v at ymrl v at-eëmtl v aër npyu mxpeut eknonl
Arvadite Zemarite Hamathite Canaanites

19 v lel gbul eknonl myldn bako grre od oze bako sdmo v omre v adme
Canaanite Sidon Gerar Gaza Sodom Gomorrah Admah
v yblm od lxo
Zeboim Lasha

ch ch
20 ale bnl ëm lmxpëtm llxntm barytm bgvlem
Ham

21 v lxm lld gm eva abl kl bnl obr aël ipt egdul
Shem Eber Japheth

22 bnl xm olm v axur v arpkxd v lud v arm
Shem Elam Asshur Arphaxad Lud Aram

ch
23 v bnl arm ouy v ëul v gtr v mx
Aram Uz Hul Gether Mash

ch ch
24 v arpkxd lld at xlë v xlë lld at-obr
Arphaxad Salah Salah Eber

ch
25 vl obr fld xnl bnlm xm eaðd plg kl blmlv nplgo cary v xm aðlv lqthn
Eber Peleg Peleg Joktan

ch
26. v lqtbo lld at-almudd v at-xlp v at-ovrmut v at-lrð
Joktan Almodad Sheleph Hazarmaveth Jerah

27 v at-edurm v at-aual v at-dqla
Hadoram *Uzal* Diklah

28 v at-oubl v at-ablmal v at xba
Obal Abimael Sheba

ch
29 v at-aupr v at-ðvlla v at lnbb kl-ale bnl lqtbn
Ophir Havilah Jobab Joktan

30. v lol mwxbm m-mxa bake *spre er* oqdm
Mesha Sephar

31 ale bnl xm lmxpðtm llxgtm barytm lgulem
Shem

ch ch
32 ale mxpðt bnl-nð ltuldtm bgulem umalo nprdu egulm bary nðr embul
Noah

ALSO OF JUDGES XII, 6

ch
v lamru lu amr na *sblt* v lamr *sblt* v la lkln l dbr bn v laðzu autu v lx
Shibboleth Sibboleth

etbuðu al mobrut elrlen v lpl bot cela maprim arbolm v xnlm alp

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On the Grapeville Gas-wells. By J. P. Lesley.

(Read before the American Philosophical Society, March 6, 1891.)

Mr John Fulton, General Manager of the Cambria Iron Works, at Johnstown, Cambria county, Pa., has kindly furnished me with the following particulars of one of the most important and significant episodes in the strange story of Petroleum in Pennsylvania.

1. A report to him made October 12, 1888, by Edgar G Tuttle, then Mining Engineer of the Company. This gives —(*a*) the number of wells (27 or more) around Grapeville, in Westmoreland county, up to that date sunk and piped by different companies ;—(*b*) the length and sizes of the pipe line to Johnstown ;—(*c*) the pressures of gas at the well at the 4th, 8th, 12th, 16th, 20th, 24th, 28th, 32d, 36th and 39th mile, and at the Cambria Works terminus.

2. A second report made to him two years later, February 23, 1891, by M. G. Moore, now Mining Engineer of the Company. This gives —(*a*) the titles of eleven companies owning 65 gas-wells in the Grapeville district ;—(*b*) an account of the drilling especially of the Agnew well ;—(*c*) a table showing the decline of pressure at the Westmoreland and Cambria Companies' wells, from 386 lbs. on April 29, 1889, to 61 lbs. on February 2, 1891 ;—(*d*) a full table of the Co.'s thirteen wells, depths, dates of striking gas, the initial pressure of each, subsequently observed pressure at April 29, 1889, December 15, May 26, November 8, December 1, 1890,

January 5 and February 2, 1891, the first six wells starting with 460 lbs. and ending with 70 and 65 lbs. ;—(*e*) a diagram of the mode of piping the Agnew well ;—(*f*) a map of the country between Pittsburgh and Johnstown, showing location of groups of wells

Mr Fulton was prompted to sending me the data described above by his remembrance of my address, some years ago, at Pittsburgh, before the American Institute of Mining Engineers, in which I reiterated my belief on geological grounds in the comparatively speedy extinction of the rock gas industry of the country He adds "You will notice that recently one of the wells [at Grapeville] has been deepened to reach the 'Gordon sand,' and that a small supply of gas was found in this second and lower horizon of natural gas, but not enough to warrant any hopefulness of its maintaining the supply A part of our works are being supplied yet with the natural gas from Grapeville, but it is weakening so fast that we have got to supplement it with artificial gases" (February 26, 1891)

My warrant for publishing in the Proceedings of this Society these most important geological and historical data is found in Mr Fulton's words "I do not think that there is anything in this report that is so private or confidential that it should not be made known, and you can therefore use the matter in these reports as you think wise At the Cambria works we are using the Archer oil gas to take the place of the natural gas, and we are finding this to be a very good substitute. As you know, the Archer process consists in vaporizing fuel oil, and mixing at a very high heat steam with the oil We have also opened our mines again here and are using coal in a great many sections of the works" (March 12, 1891).

October 19, 1888, the Westmoreland and Cambria Natural Oil Company owned seven (7) wells, located principally along Brush Creek, northeast of Grapeville, Westmoreland county, Pa Three wells were connected with the pipe line , the others were held in reserve, two of them being drilled to a thin crust of hard rock (silica) just overlying the gas sand, which served as a hermetical cover to prevent the escape of the gas, even at its high pressure in the gravel sand rock beneath it

This fact is important as explanatory of the retention of the gas in the rock for past ages.

The wells are 1100 to 1400 feet deep, according to their locality in the valley or on the hill, the gas rock lying nearly horizontal.

The pipe in the well is of 5 inch diameter

The two wells, A, A', on the map, were turned on full for the pipe to Johnstown, the well B being turned on more or less as a regulator of the supply at the Cambria works.

The pressure at top of well was 330 lbs., as the 10-inch main to Johnstown would not stand a much higher pressure.

There seemed no difference in strength or volume of gas per minute blown off (free) by one of these wells, in Mr. Tuttle's presence, compared with that which he saw two years before at a free blow from a well just north of Grapeville Station.

The gauges were noted often, so as not to permit the pressure to rise much above 530 lbs.; and when this seemed likely to occur well B was shut sufficiently to reduce it again to 530 Formerly a weighted safety-valve, allowing a free blow, was used Saturday evenings wells A, A[1] were closed, and only B used "The gas in this field is not being wasted as formerly, or as greatly as it has been in the Murraysville field, and the prospects are that the Grapeville field will last the longer of the two."

"I understand that the flowing pressure in the Murraysville field is now [October 13, 1888] 250 lbs. The Grapeville wells have great volume When one is blowing off in the air and then is shut quickly, the gauge runs up in fifteen or twenty seconds to 525 lbs. In some districts the wells require a minute, and even longer, to reach their normal of 500 lbs. The weaker or low-pressure wells require days to reach their normal pressure "

As it is impossible to store or tank gas, wells are now drilled to within a few feet of the gas horizon and "held" there. When the supply from other wells weakens, these wells are sunk into the gas rock, one after the other, to keep up the supply.

Wells that have broke through to the gas are restrained by a "packer," a thick, heavy rubber cylinder, 20 inches long, outside diameter ½ inch less than bore of well, fastened at the ends to the pipe going into the well (see cuts) The end of this pipe fits into the end of another pipe, making a "slip joint;" rubber flush with the outer diameter of the pipe, lower joint generally perforated to admit the gas, pipe A lowered into the well (and, if necessary, pressed down) to slip into pipe B, bulging the rubber packer against the sides of the well, and effectually stopping the rise of the gas *outside* the pipes. It can then be controlled by a valve at the top of pipe A, at the well mouth Before this invention the gas could be held only below a certain pressure, above which it would force its way between the pipe and the sides of the well and blow the whole casing into the air The economy to a district of the new "packer" is evident.

"At present (October 13, 1888) there appears to be no weakening of the supply, except when unusual and sudden demands are made on the gas. If the supply weakens, or a greater supply is needed, more wells may be added to the line This may require the laying of more pipe, or the replacing of the present 10-inch main by a larger one. The W & C Company own about 20,000 acres, controlling a large part of the gas field."

The companies and wells around Grapeville in 1888 were as follows.

Westmoreland and Cambria, 7 wells, drilled between 1885 and 1888, three of them piped to Johnstown

Carnegie, 6 wells.

Southwest, 2 or more, piped to Connellsville, etc. (drilling also on Brush Creek).

Greensburg Fuel, 2 wells, piped to Greensburg

Jeanette Glass Works, 2, piped one mile west to the works.

Philadelphia Co., drilling near New Salem.

Owners unknown, 8 or more wells.

The W & C. Co have also seven wells (about 1400′ deep), three miles northwest of Latrobe, on a northeast and southwest line 2½ miles long The northern three have a 6 inch pipe to Latrobe The other four have a 10 inch pipe running east by Derry Station, P R R., to Laurel Hill, where it feeds into the Grapeville Johnstown main about ten miles from Johnstown The flowing pressure of the wells supplying Johnstown is 200 to 275 lbs. per square inch That of those supplying Latrobe, 90 lbs

Trial wells east of this field have been unsuccessful, very little gas being found

Salt water flowed from some of the Latrobe group of wells.

The first and most northern well the Fowler, was drilled in 1885, the last and southernmost, Miller, No. 3, in 1887. Their volume of gas does not equal that of the Grapeville wells, and requires a much longer time to gauge up to the same normal of 500 lbs.

The proposition at first made to land owners, to pay $40 or $50 for a 50 lb well, and $1 00 extra for each additional pound, was *not* generally accepted

Pressures along the main at every four miles (taken in 1886 and 1887) show the *loss of pressure by friction* in a pipe of 10″, increasing to 12″, 16″ and 20″, thus.

For first 20 miles 8250′, *ten* inch pipe of ⅜ in wrought iron.

For next 12 miles, *twelve* inch pipe of ⅜ inch " "

For next 7½ miles, *sixteen* inch pipe of $\frac{7}{16}$ in. cast "

For last 1½ miles, *twenty* inch pipe of (?) " "

In the first column of the following table H S. means High side At the 39th mile, the gauge is at "Reducer low side" C W means the Cambria Works at Johnstown.

Table of Pressures to Show Loss by Friction.

Distance from well	Size of pipe.	1886. ——	1886. Nov 12	1887 March.	1887. March 15
0	10 in.	135 lbs.	200 lbs.	320 lbs.	348 lbs.
4	"	149	183	313	320
8	"	132	170	283	303
12	"	120	148	235	261
16	"	113	129	208	212
20	"	84	100	166	166
24	12 in.	73	85	132	130
28	"	63	70	95	95
32	16 in.	55	58	75	76
36	"	53	51	54	57
H S.	"	52	50	53	56
39	"	30	—	26	25
C W.	20 in.	30	—	25	25

Table of Wells and Ownerships, February 25, 1891.

Greensburg Fuel Gas Company	5	wells.
Southwest Natural Gas Company	9	"
Versailles Natural Gas Company	8	"
Youghiogheny Gas Company	8	"
Jeannette Glass Works	4	"
Manor and Irwin Gas Company	9	"
Westmoreland Specialty Company.......	1	"
Westmoreland and Cambria Natural Gas Company ..	18	"
Carnegie Brothers & Company	11	"
Philadelphia Natural Gas Company	23	"
National Tube Works.	6	"
Total number reported by M. G Moore	85	

The W & C. Company's 18 wells are all piped to Johnstown Their depths and pressures at various dates may be found on a following table The deeper are on the hilltops. They all get their gas in the Gants sand rock of *Washington county* Well No 19 was deepened with the design to reach a lower gas sand horizon, but the rope was cut by the sharp sand driven up by the gas issuing from the Gants sand Before the tools could get through it they were lost, and fishing tools also afterwards, so the well was abandoned, and No. 18 (Agnew well) was drilled a short distance south of No. 19

This new Agnew well reached the Gants sand January 15, 1891, went through it, and was cased with 8 inch pipe, packed just above the top of the sand, supplied with another inner 6 inch pipe; packed again at the bottom of the sand, and the Gants sand gas between the pipes laid into the Johnstown main.

Drilling was resumed through the 6 inch pipe, and stopped, February 21, 1891, at 2700 feet. The "Gordon sand" was found at 175 feet beneath the Gants sand, was 35 feet thick, and gave gas at only 80 lbs pressure, which, however, in twenty minutes rose to 175 lbs, "when it was necessary to discontinue the test," why is not explained "While the *pressure* in the Gordon is now (February 25) very much greater than in the Gants, the *volume* is much *less*, as is clearly shown by comparing the *minute pressures*, that of the Gants being 65, and of the Gordon only 30 lbs." [A diagram of the pipe and packing arrangement for passing through the Gants sand, and drawing off its gas to Johnstown, is appended to Mr Moore's report.]

Below the Gordon sand, for 1070 feet to the bottom of the well, not a sign of gas or gas rock was observable. [This only bears out all Mr J. F. Carll's observations, published in his reports on the oil regions, especially his Seventh Report, I 5, just published by the Geological Survey of Pennsylvania.] The failure of the Agnew well to get a good supply from the Gordon sand does not necessarily condemn it over the whole Grape-

ville field, as it may be found in better condition in the central and northern parts of the field. Carnegie Bros. have begun drilling two or three wells to test the Gordon sand a little north of the centre of the Gantz field, a mile from No. 10 (Sylvis well).

None of the Latrobe wells are piped to Johnstown.

Grapeville.—Table of Minute Pressures at Various Dates.

No.	Name.	Depth.	Struck Gas	At First.	Apr 29, 1889.	Dec. 15, 1889.	May 26, 1890.	Nov 8, 1890.	Dec. 1, 1890.	Jan. 5, 1891.	Feb. 9, 1891.
1	Klingensmith	1100′	Feb 18, '86	460	390	250	186	160	95	75	65
2	Henry	1183′	June, 1886	"	380	260	170	105	100	"	70
3	Moore ..	1140′	" "	"	390	"	175	100	93	"	65
4	Walker......	1144′	Oct., "	"	390	"	170	105	100		
5	Brown	1234′	May, 1887	"	390	"	180	100	90	75	65
6	Ferree.. . .	1319′	Aug., "	"	380	240	170	"	100	"	70
7	Minsinger . .	1466′	Nov 21, "	410	390	"	"	95	85	55	40
8	Shutts	1469′	Feb 19, '89	380	"	250	185	100	"	70	60
9	Kipple	1360′	Nov 30, '89	260		260	"	"	95	75	65
10	Sylvis	1357′	Jan 18, '90	285			170	103	100	"	75
11	Truxel . .	1267′	Feb 20, '90	235			180	100	95	"	"
12	Byers	1350′	Oct, 1890	125							60
13	Agnew .	1420′	Jan, 1891	75						65	65

The steady decline in minute pressure from 386 lbs. on April 29, 1889, to 65 lbs. on February 9, 1891, predicts a speedy extinction of the use of natural gas at the Cambria Works

Calculating the average *rate per day of the observed decrease* we find it to be as follows

From April 29, 1889, 646 days, 321 lbs. .5 lbs. per day.
From Dec. 15, 1889, 418 " 188 " 0.450 "
From May 26, 1890, 258 " 107 " 0.415 "
From Nov. 8, 1890, 91 " 36 " 0.395 "
From Dec. 1, 1890, 68 " 30 " 0.440 "
From Jan 5, 1891, 35 " 7 " .2 lbs. "

I take this opportunity to suggest that we have in the decline of gas pressure in all wells of all gas regions the most cogent of arguments against the theory that *gas pressure* is produced by the *hydrostatic pressure* of the locality. For, it is self-evident that the hydrostatic pressure must remain always the same, and therefore cannot be the *vis a tergo* of a variable oil or gas pressure; otherwise this last should also remain constant to the last drop of oil and the last cubic foot of gas coming from the well The gradual decline of gas pressure in every well and all wells is proof positive that it represents the gradual exhaustion of an *inherent force of self-expansion* not dependent upon any *hydraulic vis a tergo*.

Notes on Hebrew Etymologies from the Egyptian ANX Enoch; Anoki, Enos. By J. P. Lesley

(*Read before the American Philosophical Society, March 6, 1891.*)

Forty years ago, in my Lowell lectures on the "Origin of Man," I gave my views of the Arkite symbolism embodied in the crux ansata, or ANX symbol of life. They were not accepted; but I still regard that line of investigation as one entirely germane to modern scientific research, and capable of bearing good fruit, although my application of it to the crux ansata is much less probable than I then thought it, for the latest archæological results are rather in favor of regarding that symbol as a rude drawing of the human figure.

My present purpose is to direct attention to the influence which the universal use of this symbol in all ages of ancient Egyptian history must have exercised over the philology of surrounding races. Its name, ANX, the living, the alive, life, etc., was certainly the most sacred word in the Egyptian language; in general and constant use in their religious literature; on the lips of all their thinkers, and, in fact, of all classes of the population of the valley of the Nile, in all generations, and was embodied as an element in the personal names of pharaohs, nobles, priests, and common people, the evidence of which pervades the monuments and papyri. Every royal cartouche had the *anχ* scrupulously written after it, usually with the *tet*, to mean *the ever living, the immortal*. *Pu anχ* is an instance of the designation of a pharaoh (Pierret). The use of the *anχ* *inside* the cartouche was later, for example, in the Ethiopian kingdom, and by Psammeticus II and III. The granddaughter of Piankhi II was named *Anχ shap-n-ap*, the daughter of Takelot II, *Anχ-karama t*, a princess of the family of Psammeticus II, *Anχ ra nefer-het*. Two places or cities in Egypt are known called *Xafra anχ* and *Assaka-anχ*, evidently dedicated to the memory of the Kas, or spirits, of those monarchs, one of whom built the second great pyramid of Gizeh. A quarter of the oldest capital of Egypt, Memphis, was known as *Anχ-taui*, the life (or heart) of the two lands, Upper and Lower Egypt.

The word was popularly used, like our word "viands," for food of any kind that supports life. *Anχ-am* was the name of a tree, used as we use the word "live-oak," and Lepsius quotes a curious sentence of great interest to Hebrew scholars: "Ra, the sun, who makes the tree of life (*am n-anχ*) green, producing things which issue from it," suggesting the "tree of life" (עץ החיים, more properly *the tree of living things*) of the garden of Eden.

The Egyptians seem to have used *anχu*, also, as the general plural name for all flowers, the plainly living parts of plants.

The Egyptians called a mirror *anχ*, because it represented the living object presented to it. They called the two eyes *anχ ti* because the life of an animal is best seen in his eyes. But they gave, curiously enough,

the same name to the two ears, and only distinguished the terms apart in writing, by drawing the ideograph of eyes in the one case and of ears in the other The pharaohs had two high officials, one called "his eyes in the south," and the other called "his ears in the north"

But *anχ* not only meant to live, to be alive, but had another derivative meaning, with a very remarkable application to the story of Enoch, viz., *to lift oneself*, *to rise* up and stand, *resurrection* and *ascension*. This meaning it retains in modern Coptic, as ONK, *extulit*, *resurrexit*. An inscription at Edfu uses it for "the sun rising in the east." At Dendera is a picture of a sacred boat, in which stands a lotus flower, from which a snake is rising into the air, with the legend. "The snake ascends (*anχ*) from the lotus of the ship." On the sarcophagus of Besmut, at Luxor, is read, *anχ f*, etc.: "He ascends like the ten stars." Another inscription reads: "The stars ascend (*anχu*) in heaven." And at Esne: "The stars ascend (*anχu*) to do their duty in the night." At Abydos, an inscription to King Seti I, of the nineteenth dynasty (before the date of the Exodus), addresses him thus "Thou goest up (*χe-k*) above the earth like the bark of Orion in its season, thou arisest (*anχ ta*) like the Star Sothis" (see Brugsch's Dict., pp. 198, 199).

The Hebrew tradition that the Hebrews came out of Egypt agrees with the fact that Moses, Aaron, Hur (named together, Exod. xvii, 10), Miriam, Achsaph (Caleb's daughter), Manasseh (Joseph's son), and other early legendary personal names, are purely Egyptian. The intercourse of the two peoples was always intimate. The kings Asa, Amon and Manasseh had Egyptian names. Before the exile, the Hebrew colonies in the Delta were important. The Book of Genesis was not necessarily compiled at Jerusalem. The story of Joseph and Potipher's wife was based on the D'Orbigny papyrus. Adam and Seth seem to be the names of the two chief Delta deities Atum and Set. Noah and his wife seem to represent the Egyptian divine duad Nun and Nunt. There is nothing startling, therefore, in finding the *anχ* in the name Enoch, whose legend forms an episode in the antediluvian list.

The occupation of Southern Syria by the Egyptians dates back to the most remote times. The cartouche of Snefru, first king of the fourth dynasty, builder of one of the great pyramids, is cut on the rocks of the Sinaitic peninsula, at the turquoise and copper mines. The Hebrew legend of the *Anakim* of the Hebron country gives Anak three sons with Egyptian names, Ahiman, Sesai, Tolmai, fathers of the three tribes of the Anakim. Whether there was any philological connection or not, the compilers of Exodus seem to have seen the *anχ* in the name *Anak*, and described therefore the people as a giant race, analogous to the ghostly or demoniac Rephaim.

Remembering the large Greek element in the Delta far back in the centuries before Christ, and the Greek tradition that as Cadmus came from Phœnicia and settled Bœotia, so Cecrops came from Sais in Egypt and settled Attica, bringing with him the goddess Neith (Pallas Athéné), we

might confidently expect many Egyptian words and names in Greece. Of these I will only allude to *Inachos* (*anch*), son of Oceanus and Tethys, who founded the Kingdom of Argos; and the sacred rivers *Inachos*, one in Argolis, the other flowing from Mount Pindus.

But to return to proper names in Hebrew; perhaps the most interesting of them all, in an etymological way, is that of *Enos*, the legendary grandson of Adam, in the second account of the creation in the fifth chapter of Genesis, the chapter which contains the name of Enoch. The word Enos is written, whether rightly or wrongly, אֱנוֹשׁ, and pointed so as to be pronounced *Enosh*. The same word, written and pointed in the same way, occurs in the 55th Psalm and Job v, 17, with the meaning *a man*, but usually appears in the Hebrew books with a collective meaning as *mankind*. It occurs in *Son of Man*, Ps. cxliv, 3. Isaiah viii, 1 is directed to write with a *man's stylus*, that is, in the vulgar or common or demotic script, so that everybody could comprehend. Like Adam (man) it had no plural. But in later days, as when the Book of Daniel was written, the third letter had been dropped and the word became *anah*, or emphatically *anahé*, meaning *man*, *mankind*, *man as man*; and this gave the common plural *anashim*, *men*. It repeatedly occurs in this book in the phrase "Son of man" A still further contraction of it gave the popular form AISh, איש, *man*, with its feminine *aishé*, *woman* (as the Greek ἕνς, *one*, was contracted into εἷς, with a closer connection between the two languages than Gesenius here suspected).

In the pronunciation of words we must keep in mind that until the age of printing spelling has always been optional, and pronunciation local. Words passed from ear to ear, not from eye to eye. The same word was pronounced gutturally or dentally or lingually by different races and individuals, and written accordingly Words were clipped, and written accordingly Every Egyptian, Hebrew or Greek scholar knows this. Whether the *Anch* was spelled with an aleph, heth or áyen, it remained the same word. In one part of Egypt it was pronounced *anχ*, in another part *anah*; just as the East Germans say *ich*, the North Germans *ik*, and the West Germans *ish*, for the English *I*, which the Greeks and Romans pronounced *eg o*, the Hebrews *anoki*, the old Egyptians *nuk*, and the Copts *anok*. By reference to Admiral McCauley's Dictionary, published in our Transactions in 1883, you will see at the top of the first column, on page 29, "*Anχ*, life," followed by "*Anah*, to exist, to subsist." Other proofs it is unnecessary to adduce to show the practical identity of the Egyptian *Anχ*, ☥, and the Hebrew *Anosh*, *Ish*, *man*, *Enos*.

As to the genetic connection of *Anχ* and the Hebrew *Anoki*, *I*, the first personal pronoun, I would approach the subject with all possible caution. It is a fact that the pronoun was written *Ani*, without the *k*, especially in what Gesenius calls the "silver age of the Hebrew," Eccles. ii, 1. 11, 13, 15, 18, 20; iii, 17; iv, 1, 2, 4, 7; vii, 25. In Gen. xv, 7, and xxiv, 24, it stands alone (including the substantive verb) for *I am*. Schwartze, in his "Coptic Grammar," pp. 340, etc., seems to quite settle the fact that the final

guttural was not a characteristic element of the first personal pronoun And yet Gesenius seems to feel no hesitation in saying that the Hebrew *Anoki* (ANKI) "is the *primary* and fuller form of *Ani*," being more frequent in the Pentateuch (but in general more rare) than the shorter form *Ani;* and in some of the later books, as the Chronicles and Ecclesiastes, wholly disappearing, just as the guttural of the Saxon has been lost in modern English, and that of the Franks in modern French He notices that the form *Anoki* occurs on the Phœnician monuments and in the Chinese NGO. The Sanskrit used only the guttural *aha*, like the Greek, Latin, German, etc, while the Aramaic, Arabic, Abyssinian have lost it, and use the shorter nasal form of the pronoun. It seems hardly possible, therefore, to avoid the conclusion that ANK was the primitive form of the first personal pronoun, and that it stood in genetic relationship to the Egyptian symbol of life, the *anχ* Whether the symbol was constructed from the ideograph for *I* (a man with his arm bent pointing to his mouth) or not, I leave to the judgment of others.

But Gesenius remarks somewhere that *Anoki* is used in some Hebrew passages as an emphatic *I myself* This would point to the constitution of the pronoun as a dissyllable, with a final KA, the well-known hieroglyph for the dead man's *spirit*

I should like to draw attention to the identity of *ani*, the pronoun, and *ani*, the Hebrew (and generally Shemitic) word for *vessel*, not only a vase, urn, bucket, etc., for holding water especially, but also a *ship*. The human frame was called a *vessel* (of wrath or righteousness, of mercy. etc., etc), and may easily have been originally regarded as the *vessel of life* par excellence. Were this idea feasible, it might return us to my former arkite (ship mountain water) interpretation of the *crux ansata*.

On an Important Boring Through 2000 Feet of Trias, in Eastern Pennsylvania. By J. P. Lesley

(Read before the American Philosophical Society, April 3, 1891.)

The Eastern Oil Company's trial bore-hole on the Stern farm at Revere (Rufe's Corner), Bucks county. Pa., is 18 miles south of Easton, 16 miles north of Doylestown, 7 miles west of Riegelsville, 5 miles from Kintnersville, 8 miles from Munroe, 10 miles from Durham furnace, 1½ miles from Bucksville, 2½ miles from Ottsville, 4 miles from Ervina, and about 2 miles east of Haycock trap hill.

The following record was written from dictation of Mr. E O. Rosenzl, 3414 Smedley street, Tioga, Philadelphia, February 25, 1891, Superintendent of the Company.

This is the first deep boring in the Mesozoic belt of Pennsylvania,

known to me. Had my advice been asked I should have dissuaded from a costly attempt to find oil or gas in this formation The record of the boring, however, is valuable to the geological student as the hole descends through 3075 feet of nearly horizontal strata of gray and brown mostly soft sandstone and shale, with some dark ("black") slate, one stratum of which (called "anthracite coal") produced an excitement in the district, and was extensively published by the newspapers

It is almost needless to say that a bed of *anthracite* coal in undisturbed strata of Mesozoic age, and at a distance from trap, would be an incredible occurrence. The trap of the Richmond, Va., field only turns the bituminous coal bed to coke.

It is also hardly necessary to explain that a "*nine foot bed* of anthracite coal" anywhere in the brownstone belt of Bucks and Montgomery counties could hardly conceal itself underground. All the strata crop out to the surface, and such a stratum could not well escape exposure Even smaller lenticular bituminous coal seams like those on Deep and Dan rivers in North Carolina, ranging in thickness from four feet down to one foot, show somewhere at their outcrops. Even if the well record at this point of it were clearer than it is, the fact of the existence of any considerable coal bed (especially an anthracite bed) would have to be carefully verified, either by several additional trial holes, or by a shaft, before being believed by any geologist versed in the characteristic features of this formation.

Riegelsville is 166′ above tide, and the Revere well mouth is supposed to be about 200 A. T Its record is as follows:

8′	Alluvion .... From the surface down to	8′
103	Sandstone, brown ....Down to	118
15	Shale, red....	133
5	Shale, bluish, soft	138
10	Shale, blue, hard ...., ...	148
56	Sandstone, dark brown, *with coaly specks*	204
7	Sandstone, brown, very fine grained	211
2	"*Black slate*," soft..	213
4	Shale, blue, hard	217
223	Sandstone, red, very hard	440
	Slate, purplish, very gritty, here.	
4	Sandstone, brown, fine grained	444
31	Sandstone, gray, very micaceous	475
10	Sandstone, gray, hard rock.....	485
100	Sandstone, reddish brown	585
5	Sandstone and shale, gray	590
6	"*Black slate*," soft	596
[illegible]	Shale, reddish blue, very hard	627
44	Sandstone, reddish brown	671
21	Sandstone, brown, and blue shale, coarse and fine....	692

53 Sandstone, brown, coarse and fine 743
55 Shale, brown 800
77 Sandstone, bluish red, hard, with white clay veins .. 877
63 Sandstone, brown, fine grained 940
40 Shale, brown, soft. "*Show of petroleum*" 980
30 Sandstone, brown, hard "*Show of petroleum*" ... 1010
15 Shale, *grayish black* 1025
Shale, blue, here.
55 Sandstone, red brown, hard 1080
70 Sandstone, red-brown, hard 1150
Here cased off the fresh surface water.
5 *No record of this interval*............ 1155
31 Shale, pink 1186
64 Shale, pink 1250
10 "*Black slate, hard*"... 1260
90 Sandstone, red, "like the mass at 1150" 1350
40 "*Black slate, hard*". 1390
Here, gray sandstone
16 Sandstone, gray, hard, with very minute white pebbles as large as pins' heads 1406
3 "*Sand perfectly black and gritty;* boring easy" 1409
31 Shale, light gray, gritty 1440
7 Shale, reddish ....
6 Shale, dark blue ....
43 Shale, light gray ....
12 Shale, reddish, hard and gritty 1506
39 Shale, reddish 1545
15 Sandstone, bluish gray, fine grained rock . .. 1560
9 "COAL, ANTHRACITE"... .. .., 1569

Here, in answer to my verbal objections to the notes in his well book, Mr Rosenzl explained that the thickness might be incorrect, owing to the churning of the tools, but that it was in his opinion "certainly 5½ feet;" and that the "coal" came up in fine specks (no larger than the head of a pin) like all the other crushed and ground-up sand pumpings from the well, from top to bottom. No larger pieces were obtained; and no analyses were made. The well was worked in brackish water, which afterwards became salt water. *See below at 1616*, where salt was first noticed on the board walls of the derrick.

10′ "*Black slate rock, very hard*" .. .. 1579′
25 Sandstone, gray, fine, softer 1604
6 Sandstone, brown, hard rock.......... 1610
6 Sandstone, gray, fine, softer 1616
Here cased off the "salt water."
8 Sandstone, first dark, then light gray 1624
"Here salt water again and plenty of it."

I could get no clear idea of this from Mr Rosenzi's description He first noticed the salt as a deposit from water splashed on the derrick The salt taste was decided. *He* could say nothing about the flow, as the well was always full of water, but I could not learn that any stream issued from the mouth of the well.

16'	"*Black slate*, coarse, mixed with minute specks of COAL, and minute light gray pebbles	1640'
9	Sandstone, coffee colored	1649
5	Sandstone, brown, very fine	1654
9	Sandstone, brown, very fine	1663
21	Sandstone, brown, very fine	1684
5	Sandstone, brown, dark	1689
10	Sandstone, gray, dark, hard	1699
5	Sandstone, gray, light, sharp	1704
17	Sandstone, brownish red, of usual character	1721
15	"*Black slate*"	1736

"*Cased well against salt water in black slate, at 1736*"

"The driller remarks that here came in genuine soft black slate, which he recognized as the overlayer of the Oil Sand in Allegheny county, in the Wild Wood district where he worked." *Nothing could more forcibly* illustrate the ignorance of the well drillers as a class than this astounding statement, which is only exceeded by the ignorance of oil and gas speculators as a class, and the stockholders of the companies which they form, in giving ready credence to such statements from men whose only interest is that of obtaining their daily pay for boring wells.

2'	Sandstone, gray, fine, like 1604	1738'
14	Sandstone, brown, fine, hard	1752
28	Sandstone, brown, coarser	1780
	Cased off salt water successfully at 1752.	
5	Sandstone, brown, fine	1785
5	Shale, gray, hard	1790
30	Shale, grayish black	1820
9	Shale, light gray, bluish, hard	1829
3	"Blue Monday," (a term used by the drillers in Western Pennsylvania)	1832
26	Sandstone, bluish gray	1858
2	Shale, gray, hard	1860
10	Shale, brown, soft	1870
8	Sandstone, gray, sharp	1878
82	Sandstone, brown (or red), hard	1960
25	Shale, pink (or red), soft	1985
99	Sandstone, brown, coarse (February 21, 1891)	2084

I suppose that the boring is to be carried on to greater depth.

Mr. Benjamin Smith Lyman, Assistant on the Geological Survey of the State, whose Report on the Trias Brown Sandstone Belt of Bucks, Montgomery and Chester counties, Pa., is not yet quite ready for publication, informs me that the place assigned to *coal* in the above well record would come about 11,000′ below the top, or 10,000′ above the bottom of his general section of the formation, the coal bearing shales of Phœnixville being say 3500′ or 4000′ above the conglomerate base.

His long and exhaustive survey of the district has resulted in giving a combined thickness of more than 21,000 feet to these Mesozoic strata; in a demonstration of the duplication of its measures along the Delaware river, and in the discovery of both longitudinal and transverse anticlinal and synclinal flexures of considerable size. The latter system of folds is a very remarkable phenomenon, seeing that the folds lie with their northern ends abutting against (or riding over) the Durham hills, that range of Azoic highlands which extends from Reading into Northern New Jersey.

Mr B. S Lyman said·

Although the precise position of the Revere, or Rufe's Corner, well-boring has not been indicated within several hundred feet, it appears that the so called coal bed is part of a 600 or 800 feet thick series of generally hard green and dark-red shales at something like 11,000 feet below the top of the Mesozoic rocks, mainly red shales, of Bucks and Montgomery counties, and 10,000 feet above the bottom of them, and 6000 feet above the hard blackish shales of the Phœnixville tunnel

With a sketch he showed the course of the outcrop, a mile or so in width, of the green and dark-red shales, including the so called coal bed and one or two other blackish shale layers, with generally a gentle northwesterly dip, from the Delaware river near Milford, N J, along the east, south and west sides of a basin to Rufe's Corner, thence northwestward, westward and southeastward, round Stony Point and Bucksville, in saddle form, east of the Haycock mountain, nearly to Ottsville; then in almost a straight line southwestward for a dozen miles, past Perkasie and Sellersville, and five or six miles further southwest, though bending slightly northward at Tylersport upon the southeastern disappearing end of a rock saddle, but near *Sumneytown bending sharply* round a more important saddle so as to reach Harleysville, half a dozen miles to the southeast, and there with a like decided bend in the opposite direction, but with a wider sweep, turning southwest and then nearly west, passing a little more than a mile south of Shwenksville, and so in a straight course to the Schuylkill, between Linfield and Sanatoga and some three miles below Pottstown.

The course of these comparatively hard beds is marked nearly everywhere by a decided ridge, particularly well defined between Ottsville and Sumneytown, and tunneled through at Perkasie. As the beds are partly green, their course is also indicated by the yellowish or greenish gray

color of the surface of the ground contrasted with the red on either side from the several thousand feet of red shales above and below, except where trap replaces them above for a long distance from the Haycock southwestward. The geological structure is also well shown by very numerous observed dips and strikes.

Here and there among the harder beds, exposures have been observed of a couple of blackish shale layers some three feet thick, perhaps identical with those of the boring. One was seen by the roadside near Rufe's Corner; two in a ravine a mile and a half north of Ottsville, where some digging was done half a dozen years ago in a vain search for coal of any economical value, though small traces of it appear to have been found; another exposure of blackish shales was seen half a mile west of Perkasie; and still another about a mile east of Harleysville.

It is, of course, extremely improbable that the beds with a known outcrop of about sixty miles in length, cut across by numerous streams and roads and by several railroads and even in great part by a tunnel, and familiar throughout every foot of its surface to the highly observant inhabitants of the country, could have a coal bed of any value that should never, until this well, have been discovered through any complete natural exposure or through an occasional very noticeable outcropping or blossom. Indeed, facts observable on the surface, such as measured rock exposures, combined with proper regard to their dips, strikes and relative position and elevation, could no doubt give a very complete section of all the beds pierced by the well, and perhaps that will prove to be possible even with the somewhat rough collection of materials already made. From such observations on the surface, the character and thickness of each bed is to be known far more precisely and thoroughly than could be possible from any boring however careful, and beyond all comparison with the results of an ordinary one. The difficulty of accurate information from such wells is shown by the doubt in the present case whether the so-called coal bed was nine feet in thickness or five and a half.

The well record, in spite of all the imperfections that must be expected, has value as giving for a great thickness of rock beds a connected view that may serve in some degree as a check upon the not very essential errors that might arise in combining surface observations, especially those rough ones hitherto obtained. But the chief importance of the record is perhaps as an illustration of how ready men are to lay out thousands of dollars for such explorations where the same number of hundreds would by a surface survey give fuller and more accurate information.

Possible Sterilization of City Water.

By R. Meade Bache.

(Read before the American Philosophical Society, April 17, 1891.)

It is an open question whether the characteristic acidity of the digestive fluids is or is not efficacious in destroying pathogenic germs entering the stomach. But it ought to be evident on both sides that neither extreme can represent the truth, even if the digestive fluids possess that general property. It is certainly, on one side, too much to assume that, not even in a perfectly healthy stomach, are those fluids sometimes capable of eliminating such germs from the system, and, on the other, that they are always, in sickness or in health, capable of performing that task. So little vitalized are micro-organisms in their resting-stages, that it is easily conceivable that, when masked by food and water, and when the human system is in a weak condition, many escape the possibly destructive action of the healthiest digestive secretions.

It would, additionally, be an unwarrantable assumption, even if the healthy stomach were proved to be able always to neutralize the morbific action of pathogenic germs, that they find their inevitable path and exit, with or without vitality impaired or destroyed, dead or alive, through the alimentary canal; for in point of fact we know that one kind, at least partially, takes its disastrous course directly into the lungs. When the infinitesimal size of micro-organisms is considered, and when also is considered how varied is the character of the parts with which they must come into contact upon passing the œsophagus, it will readily be perceived that, even if they escape the sometimes assumed destructiveness of the digestive fluids, they must often be absorbed into the blood by other tissues as well as by those of the lungs.

If so believing, we should perceive at the same time that it is hopeless to contend, except by palliative sanitary measures, against the invasion of pathogenic germs through inhalation; but that, on the other hand, especially as our food cannot be sterilized wholesale, we should deeply consider the possibility of contending with them by means of the wholesale sterilization of water, which enters alone, or as the largest constituent, into our

drink. That this has heretofore not been attempted is all the more remarkable, because it is believed by many persons that some of the worst forms of pathogenic germs reach us through the medium of drinking water. Inasmuch, therefore, as success in sterilizing the drinking water of a large city might be of untold benefit to it, it would be well that certain experiments were tried to that intent, upon the assumption that, be the pathogenic germs in a particular water many or few, they become, when received into the alimentary canal, whether or not large numbers of them are successfully dealt with by the stomach, injurious to the human economy.

Inherent in the Anderson iron process for the purification of water is a danger which, therefore, cannot be eliminated. In all processes there is a danger line which human foresight seeks to avoid by a safety-margin, which, in the long run, and in the nature of things, is a substantial guarantee against harm. But there are processes such, from their character, combined with the chapter of exigencies and the chapter of accidents, that they have but a small margin of safety. I place the Anderson process in this category, as an experience at Berlin, showing the danger that may result from the overworking and freezing, or both, of open filter beds, even if so acted upon and cleansed as they are intended to be by the Anderson process, fully warrants me in doing. Moreover, it should be incidentally mentioned that the process is not applicable to the constitution of all waters, or adapted to climates that have always, or are liable to, severe winter cold. It is said, however, upon excellent authority, based upon the indisputable evidence of microscopic examination, that by the process micro-organisms have, under the limiting conditions hereby implied, been neutralized in the proportion of 50,000 to about 20, virtually in the proportion of 50,000 to 0. But, coincidently with this result, which must obtain under favoring circumstances, there also always exists danger in the process through carelessness and neglect in filter cleansing, and necessity without law of overworking the capacity of a filter. As a finality in the process the ferric hydrate generated, blended with organic matter, is precipitated in a flaky, coagulated condition to the bottom of the water, the sand filter-bed of the settling reservoir, where, resting chiefly on the surface, the filter is therefore more readily than usual cleansed. The process therefore

makes no pretense to destroy the micro-organisms, but merely to neutralize as much as possible their injurious action in the human economy, simply by entrapping them. What I contend, however, is that the best process of sterilization is that which does not seek to entrap micro-organisms, with the inseparable danger of their partial or almost entire escape alive, but that which, with abstention from their purposive arrest, kills, and allows them as free passage as possible to the stomachs of city dwellers It will probably be thought at this point, with a very usual misconception, as that which we have in the Anderson process has proved quite efficacious, whereas that of which I speak is but an ideal, perhaps impossible of attainment, that I am proposing to accept a shadow for the substance of a thing I would grant the cogency of the thought, had I ever intended to make denial of the excellence of the Anderson process, and proposed to offer a possibility in exchange for a reality. But, having taken neither of these positions, I do but state the case in the abstract, and the truth of it in that form being admitted (and I do not see how it can be denied), I have but to add before proceeding that, excellent as is the Anderson process, within its acknowledged lines, it would still be well to consider if the ideal one is not capable of accomplishment by the means which I am about to suggest

About two years ago it occurred to me that before experimenting with bacteria, with reference to killing bacilli established in the human body, and with reference to the sterilization of city drinking water by electricity, I would pass a current through some water containing protozoa, and observe how much is required to kill them With this purpose in view I took a glass tube of four inches in length and five thirty-seconds of an inch in calibre, and partially filled it with water teeming with protozoa from hay-infusion, which had previously been examined by me under the high power of a one-tenth microscopical objective, commanding a large field with an immersion lens, and depending upon which of two eyepieces was used, magnifying from five hundred and fifty to six hundred and fifty diameters. When both ends of the tube had been plugged up with brass eye-screws wrapped with paper, leaving their ends exposed in the tube, the volume of infusion intervening between the ends of the poles thus formed was only two-thirds of a cubic centimeter, and the

distance between the poles only three inches The electro-motive force at my disposal in my galvanic battery—only about thirty volts—was too small, and the resistance too high under these conditions for me long to hope to affect the protozoa in the tube by means of the current. The smallness of the volume of fluid in which the electricity could find play, and the liberation of hydrogen which could not escape or recombine, were together the cause of this; the resistance from the latter cause proceeding by great leaps when a higher current was eventually employed. With the infusion the resistance was far less than with pure water, but still far too great to allow of much current, owing in sum to the small volume of liquid and to the increased liberation of gas in it as compared with that liberated in water The current was so slight that at this point of time I was satisfied that if I were not able thus to destroy the vitality of the protozoa—and that was proved by microscopical examination—*a fortiori* it was not to be imagined that the vitality of schizomycetes in water could be arrested, because I had assumed that they would be more difficult than the other organisms to destroy, a conclusion which I do not now think warranted by my final investigation upon the basis of experiment. I therefore desisted from experimenting, and did not resume it until the work of Dr. Griffiths on micro-organisms came under my eye, from which I learned that he had killed bacteria with a very small current in media of a fluid character. I then resumed my experiments upon the basis of my previously enlarged experience, that a considerable volume of water is needed for the play of electricity, and that even a slowly increasing bubble of hydrogen in a closed tube, although far from effecting embolism, nevertheless produces rapidly cumulative resistance. Every one who deals with batteries or who is well-read in electricity knows in a general way of these phenomena; I am merely referring to the exaggerated degree in which they manifest themselves under the specified conditions I was well aware that for a given ampèrage, a given electro-motive force, a given character of liquid, a given temperature, and a given distance between poles, the resistance to a line of force of electricity is an absolutely fixed quantity. But as my final object, as will eventually be seen, was to charge a large volume of water so that upon being charged the electricity would concentrate with intense energy towards the opposite pole, it became

necessary, even in laboratory experiments, to avoid action where the phenomena appear in an exaggerated adverse form. I therefore next proceeded to deal with small but unconfined volumes of liquid.

With the Wheatstone Bridge, with an electro-motive force of one hundred and ten volts, and one ampère of current, I found the resistance at two inches between the poles, placed vertically in a hay-infusion, in a round glass dish about five inches in diameter, to be 1560 ohms. Making the liquid a little shallower, the other conditions remaining the same, the resistance rose to 2120 ohms. In a very narrow, rectangular receptacle, the other conditions remaining virtually the same, the resistance rose to 8000 ohms The poles being then placed in water, not in the infusion, in the round glass dish, the other conditions being the same as those in the first experiment, the resistance became 18,400. Slightly increasing the depth of water in the dish, the resistance sank to 13,000 ohms. These rude experiments were followed by a series conducted with two beautifully finished wooden, shellaced boxes, of exactly the same length and depth in the clear, but one of them of only half the width in the clear of the other. Thus was obtained with precision in the larger of the two (but, of course, the same consequence would have ensued with the smaller), by alternately making it exactly one-half full, and then full to the brim, the result that the volume thereby vertically obtained reduces by one-half the resistance of the lesser volume. Thus, also, by filling both boxes to the brim was obtained with precision the result that double the volume of liquid horizontally obtained reduces by one-half the resistance of the lesser volume. Therefore it was demonstrated that resistance in water, as well as in metal, is inversely proportional to volume as determining cross-sectional area, whether increased by vertical or horizontal extension; that is, is inversely proportional to cross-section, as dependent upon volume; and that in whichever of these two directions volume is gained, it introduces, proportionally, freedom of propagation of the electric force in and about the imaginary right-line joining the poles.

The result of a series of experiments, with the poles placed apart at 2, 4, 6, 8, up to 12 inches, showed that the resistance, whatever it may be, varies *directly* as the distance between the poles, a result identical with that in electrically charged wire,

illustrating a law which should have been expected to hold good whatever figure and volume the lines of force between the poles might assume and occupy. The experiments clearly proved, too, that the resistance of water is very much greater than that of an infusion not seemingly dense.

There seems to be with some persons a belief that water is a good conductor, because current electricity so readily discharges itself by means of moistened surfaces. But current electricity so discharges itself through a film of water covering non-conducting surfaces in default of any other conductor whatever; and static electricity, for the same reason, readily vanishes through aqueous vapor, because of the fact that the vapor impairs the resistance of dry air as a dielectric. Yet electricity, in these two manifestations, acts thus, of course, not from choice but from necessity, taking, however imperfect, a path of conduction when there is no other, and the better of two paths when they differ, in proportion to their relative conductivity. Other persons imagine that water is a worse conductor than it really is. Any one who uses a hydro-rheostat well knows the highly resistant property of water to the electric current; but as free and in large volume it is not practically so resistant as it is sometimes thought to be, as any one may prove for himself by the rude experiment of plunging in an ample basin of water the sponge of one reophore of a medical galvanic battery, yielding from thirty to forty volts, while the sponge of the other reophore is placed on the back of the hand submerged in the water at the distance of four or five inches. The hand, the most callous part of the body except the heel, feels the current distinctly in every part, and if it has but the smallest abrasions of the skin in places remote from each other, the electric current makes them sting, finally condensing strongly at the pole on the hand.

After trying the experiments described, I flashed one hundred and ten volts through a glass tube, with half of a cubic centimeter of hay-infusion containing protozoa, with the poles half an inch apart; and also flashed one hundred and ten volts through a looped wire going from top to bottom of a small bottle containing four centimeters of the infusion. In neither case could subsequent microscopical examination detect that the organisms had been affected in the least. The whole of the current, of course, passed through the organisms in the tube. In the case

of those treated with the looped wire it was only the residual force, which the wire did not carry, that they encountered. That under these conditions the wire does not carry all the electricity is shown in the forthcoming description of experiments, in which the work of killing bacteria was successfully accomplished with looped wire passing through fluid media, and carrying only a very small force, but for a considerable time. With so much electro-motive force as I used—one hundred and ten volts—I could not allow the discharge through the micro-organisms to be more than momentary, else they would have been destroyed for certain by the concentrated products of electrolysis

Two main conclusions seemed to me from the beginning of my experiments to be justifiable. The first of these was that, inasmuch as protozoa have no nervous system, and do not seem to be injuriously affectible by the electric current (barring its action under conditions such as generate heat almost exclusively), we are accustomed to think erroneously of the current as capable of affecting and endangering all sensation and life, solely because of our own possession, and knowledge of the possession among other animals, of a nervous organization upon which stress may be put by the current. It seemed to me that the last experiment proves what is currently believed, that an animal protoplasmic organism has, *ipso facto* of its being protoplasmic, no nervous system. The second conclusion at which I arrived was that, if protozoa of the kind with which I had dealt are not easily killed by the electric current, it would be hopeless to think of destroying schizomycetes, except by a force which, for the practical purposes that I had in view, it is impossible to apply to them, especially as, in the pleomorphic forms assumed by some of them, it is notorious that they possess latent vitality difficult to extirpate.

I am still inclined to hold to the first conclusion, as justifiable from my experiments as far as they have even now gone, that animal micro-organisms, submerged in water or any other liquid, are not susceptible to injury from electric current approaching in force the highest that I used (which may be regarded as prodigious when the minuteness of the organisms attacked by it is taken into consideration), and that perhaps they are not susceptible to injury under those conditions from any current, however high. But, as to my first conclusion, I have since found myself, upon reading the work of Dr. Griffiths, egregiously in error

through the false inference that I had drawn that, because the electric current did not destroy protozoa of the kind with which I was dealing, therefore bacteria would not be destroyed by it, at least within the bounds compatible with human life or well-being. It seems, however, that vegetable protoplasm, at least of the fungus kind, acts differently from animal protoplasm under the influence of the electric current. After reading the results of Dr. Griffiths, I gladly reverted to the intention with which I had set out in my experiments, of being able to suggest means by which bacilli forming a nidus in the human body could be destroyed and water supplied to cities could be sterilized for drinking purposes.

The author to whom I have referred is Dr. A. B Griffiths, Fellow of the Royal Society of Edinburgh. He remarks that the full details of his experiments with electricity on bacteria are to be found in Volume xv of the Proceedings of the Society In making the experiments he seems to have had no ulterior object in view but the gaining of information as to what amount of current would destroy certain micro-organisms The wood-cut which he gives at page 177 of his work, *Micro-organisms*, represents a faradaic, not a galvanic battery, as the generator of the electromotive force used in his experiments. At the beginning of mine I used both the galvanic and the faradaic battery. The receptacles in which Dr. Griffiths placed pure cultures of different bacteria were simple, broad-based, short bottles, in which were fitted from top to bottom of each bottle a single loop of wire in free electric liquid communication with the micro-organisms. He does not in any case give the resistance in ohms of the media employed in the cultures.

The bacillus tuberculosis was killed by 2.16 volts, the bacterium lactis by 2.26 volts, and the bacterium aceti by 3.24 volts. The electric current was allowed to pass for ten minutes, and the temperature of the laboratory during the experiments was 16 C. (60.8 Fah.). In another series of experiments, bacillus tuberculosis was killed by 2.16 volts, bacillus subtilis by 2.72 volts, and bacterium allii by 3.3 volts. The current, as before, was allowed to pass for ten minutes, and the temperature of the laboratory was 17 C. (62.6 Fah.). In the first series of experiments no growths appeared from inoculation in fresh nutritive media, after an incubation of twenty-five days, with the thermometer at

38 C. (100.4 Fah.); and in the second series, similarly treated, no growths appeared after an incubation of twenty days, with the thermometer at 35 C. (95 Fah.). As before incidentally mentioned, all of these experiments were made with wire looped in glass bottles. Consequently all the electricity that attacked the microbes away from the wires was the residuum which the wires did not conduct, necessarily by far the lesser portion; and as the minimum of force was not sought or obtained, what is needed may be a mere fraction of the time and force actually employed. With so small a current as that used, and with the considerable volume of the respective liquids employed—which latter point the wood-cut shows—detriment to the organisms from products of electrolysis may be deemed inappreciable.

It has therefore been demonstrated that certain schizomycetes can be killed in a short time by a low current. Presumably all others can be killed in an equally short time by an equally low current; which was the assumption with which I had set out at the beginning of my own experiments, looking primarily to destroying pathogenic germs in the human body, and secondarily, to rendering them innocuous through the sterilization of water for drinking purposes. I therefore ask myself why, if a very low current, passing for a few minutes, can destroy bacteria in a bottle, should not a much higher one, administered repeatedly for the same time, be sure to destroy them in the human body? Daily, in the course of electro-therapeutic treatment, ten, twenty, twenty-five, and many more volts are administered to patients, avoiding only strong or continuous application of the current to the pneumogastric nerve, on account of the inhibitory action of the heart thereby provoked. But I will not pause just at this moment to speak more fully to this point, but will here confine myself to the main subject of this paper, clearly set forth by its title and the tenor of the preceding remarks. Reverting to the question of the sterilization of water for the use of cities, and with the new light upon the subject, which, as it appears, I might have gained for myself, but for having been diverted from my course by a false inference, I am constrained to ask my hearers, as I have asked myself in this case also, why the attempt should not be made to destroy bacteria wholesale in the drinking water of large cities by the method previously foreshadowed.

The means at our command seem to me ample. It is true that

we cannot electrolize successfully a large reservoir of water, for in that the electricity would be too diffused to be effective. It is true that, in pipes from which water is flowing into or out of the reservoir, its germs would not be subjected to attack for more than a second. It is true that the resistance that we should have to overcome in water would be large. But, on the other hand, it is also true that the electric current that we have at our command is capable of indefinite increase. The electro-motive force of a few thousand volts (there are dynamos that generate ten thousand) thrown athwart a pipe of proper dimensions, would probably paralyze every bacterium in its path, more than compensating by force for slight duration in time as compared with the ten minutes adopted in the experiments of Dr. Griffiths, as to which it is imperative to remember that they did not determine either the amount of current, or of time required, for the destruction of the bacteria experimented upon; and, consequently, it will be observed, both force and time needed are probably very much less than his experiments on their face apparently demonstrate.

If lines of water-delivery as well as those of water-supply were subjected to the attack of the electric current, the severity of it would be more than doubled for the organisms. It would be immeasurably increased in severity; for experiments at the very beginning of bacteriological investigation clearly showed that the best mode of destroying bacteria involves the principle of repeating relatively moderate attacks upon them at intervals such as find them partially recuperated, and assail them in this the period of their least resistant vitality. The method to which I allude is that of repeated boiling of slight duration at moderate intervals of time. That they can bear this apparently severe process at all shows the protective influence for them of any fluid immersion within the chemical character that does not wholly ignore the difference of habits among their different species, and water seems to be a medium inclusive of them all. The principle involved in the mode of attack mentioned is the same as that involved in the mode of destroying bacteria here suggested. Taking it in connection with the facts that a reservoir represents a large volume of water, only a part or a few parts of which are being momently drawn upon for supply, and that many germs are constantly passing through natural phases of relatively less vitality, infinitely below that in which they, if

pathogenic, being received into a favoring host, so vigorously form ptomaines, to their self-destruction as well as that of the host, it would seem that, if upon issuing from as well as upon entering a reservoir, the water were attacked in pipes from poles all but encircling them, with an electro-motive force of a few thousand volts, all germs must reach the denizens of cities supplied from such a source, wholly innocuous, because they would be dead.

It need hardly be said that, if the poles were placed opposite to each other on a heavy metal pipe conveying water, the electricity, seeking lines of least resistance, would not pass through the water at all, but around it, through the great mass of the pipe But it should be obvious that it is easy to adapt to the place of electrical attack of a pipe a simple contrivance consisting of a section of the same diameter as that of the pipe, insulating the poles from each other, and both from the general line of the pipe. A plan that might at the first blush appear to some persons better, as not entailing thus radically breaking the continuity of the main pipe, would be to have two series of metallic insulated screws, representing by position two opposing arcs, the individual screws of which should enter and pass through corresponding holes in the pipe, the ends of the screws being uninsulated But this plan would not do at all The experiments described have proved the resistance of water to be so great that a large volume of it is required for electricity to pass easily through it. Consequently, in overcoming the resistance of water in a metal pipe with poles attached, in the form of insulated perforating screws, part of the electricity would, in making large excursions, be received and conducted to the poles by the metal of the pipe, instead of reaching them entirely through the water. But, if the pipe were interrupted by a non-conducting section, of length to be determined by the diameter of the pipe and the electro-motive force to be used, then those excursive lines of force would eventually fall into the determinate direction of the poles entirely through the water. We see this action clearly illustrated in the previous experiment, where, in open vessels, resistance to the current rapidly diminishes as we increase the volume of the liquid. We see the same thing also clearly illustrated in the case of the hand submerged in the ample basin of water, where the remotest abrasions of the skin

sting from the current, finally emerging with condensed force at the pole resting on the submerged hand. In a pipe with a properly calculated non-conducting section, the lines of force would play freely inside of the pipe, occupying and limiting there a rounding imaginary space, varying in figure with every change of force, but always, of course, having its apices at the poles, approaching which, and especially at which, would be concentrated their intensest energy.

If the full significance and legitimate outcome in conclusion from the experiments that have been detailed have been perceived, it will have been realized that, although water acts like wire with reference to conductivity, through length, cross-sectional area, and temperature—exemplifying the law of conduction by and resistance to the electric current, with reference to volume, however disposed—the difference between wire and water, notwithstanding that metal has great conductivity and water very little, is enormous with reference to difference of capacity. We have but to determine, first of all, what electromotive force is needed for the purpose of destroying germs in water, assuming that they are thus destructible, and then, upon that basis, determine what the length and cross-section of non-conducting pipe should be to accumulate and discharge the force required. One could charge a constant stream of water in an insulated pipe as never wire nor any congeries of wires nor any metallic deposit on earth could be charged with electricity, for whereas all these would soon reach their utmost capacity for localized energy, an insulated flowing pipe has back of it all earth ready to receive and effectively return the force transmitted. We, however, need for our purpose at most only a small area of that vast space. But yet it is true, and a striking exemplification of the stated fact that, given a dynamo of far less than infinite power, with poles astride an estuary's living stream, so wide, so deep, that the earth there would not fuse before a fiery blast engendered by resistance, and connected as those waters are with every drop in every brook, the encircling oceans, and the interlying land, it would send its impulse thence over the whole uninsulated globe, and backward, in myriad lines of force, with all but synchronous and omnipresent thrill!

I stated at the beginning of my discourse that it is an open question whether or not the stomach is capable of destroying

pathogenic germs. In that, of course, is involved the other open question, whether or not ordinary drinking-water is the source of disease. I have properly spoken of the questions as open ones, because so many persons are enlisted on opposite sides that I cannot venture without arrogance to decide them authoritatively. The tenor of the preceding remarks, however, must indicate that, personally, I believe drinking-water supply to be ordinarily one of the largest factors in the causation of some zymotic diseases; but lest I may have left it in doubt that I hold that view, I here state it explicitly. I have, I confidently believe, pointed out one way in which the evil may be abated, and perhaps neutralized, and this without disparagement of the efficiency of subsidence basins in their adverse influence upon bacterial dissemination As to this (with the exception of treatment with iron) the last remaining factor in the production of pure drinking-water, I shall be glad to take a more opportune time than the present occasion, when I have so long engaged the attention of the Society, to prove directly, from my still later experiments and observations, what seems directly proved by the statistics of prevalence of typhoid fever in Philadelphia and elsewhere with reference to areas of different water-supply, that subsidence basins are also an important factor in the health of a city, not only relieving water of impurities in it, represented by alluvial and effete matter in suspension, but also relieving it in a measure of the impurity due to simultaneous deposition of the bacterial bearers of poison to our homes.

As to our ability to destroy the bacillus tuberculosis in the human body, by means of percutaneous administration of the electric current, I hope that I may be allowed to say a final word. I cannot see, as I have already remarked, why, if it can be killed in a bottle with a mere fraction of two volts (as I have shown by the experiments of Dr Griffiths that it must have been killed), it cannot be killed in the patient suffering from tuberculosis, by the enormously greater electro-motive force that the body is capable of receiving without detriment in a concentrated form. This statement, however, is not intended to imply that the current would be capable of curing a case of tuberculosis which had involved caseous degeneration of the parts. If it did, it would also imply that to my mind electricity is creative. Electricity, however, although not creative, includes

among its manifold and marvelous properties not only dynamic power, but attributes regenerative of vitality, and with these two it is capable, if the experiments of Dr. Griffiths are to be relied upon, of killing the bacillus tuberculosis in the living human body, in case the lesions of the disease have not seriously impaired electric conductivity in the parts morbidly invaded; and capable also of contributing to restore healthy function to them, and thence normal structure. It remains for physicians to make the essay here indicated at no expense or risk whatever. If the treatment prove to have any virtue in it, it would apply to other bacterial diseases besides tuberculosis.

In regard to the essay with reference to the sterilization of drinking-water, experiments could be made at no great labor and expense compared with the vast interests at stake in a large city. Through microscopic tests would soon be set at rest the question as to whether to any, and if to any, to what extent germs could, by the means described, be destroyed in city water, and scrutiny of the health of the city, within the lines especially of certain diseases, through comparison of present with past records, would in successive years have its own independent and conclusive tale to tell. I pledge Philadelphia prospectively in a bumper of pure water more worthy of celebration than the best Falernian wine

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Obituary Notice of P. W. Sheafer. By J. P. Lesley.

(Read before the American Philosophical Society, April 3, 1891.)

Peter Wenrich Sheafer was born at Wiconisco, in Dauphin county, Pa., March 31, 1819. His father, Henry Sheafer, was afterwards President of the Lykens Valley Railroad Company, and Superintendent of the Lykens Valley Coal Company, mining the finest quality of anthracite coal, at the west end of the Southern Anthracite Coal field. The discovery of the Lykens valley coal bed in the body of the Pottsville Conglomerate was one of the astonishing incidents of Pennsylvania geology, and enabled the Sheafers, father and son, to establish a great trade in anthracite coal upon the line of the Susquehanna river as far as Baltimore.

Peter Sheafer was engaged at various times in his long professional life in following the outcrop of this interconglomerate coal around the edges

of the Southern and Middle fields, but without finding it in an equally good condition in any other parts of the region. He often expressed to me his hopes and his disappointments regarding it. It was but an episode in his career, for his large fortune was chiefly accumulated by the purchase and exploitation of the Mammoth and other large beds overlying the Conglomerate.

After leaving school, Peter took a full course at Oxford Academy, New York, with the object of a better geological acquaintance with coal and coal mining. But at that early date, the science of geology could hardly be said to exist. In 1835, the New Jersey and Virginia State surveys, and in 1836 the Pennsylvania survey, were begun. Prof. H. D. Rogers' first assistants were Mr. Booth, afterwards the chemist of the United States Mint, and Mr. Fraser, afterwards Professor of Chemistry in the University of Pennsylvania. The following year, Mr. Trego, Mr. McKinney, Dr. Whelpley, and others were appointed assistants on the survey. In 1838, Peter W. Sheafer received his commission, while Dr. Whelpley had charge of the Southern and Middle field, and Mr. McKinley of the Northern field. Henderson and I were the next year Whelpley's aids, and I saw little or nothing at that time of Peter Sheafer, who was busy with his own part of the field work, and was laying the foundation of that accurate knowledge of the order and quality of each coal bed which enabled him afterwards to make himself easily the principal practical mining engineer of the anthracite region. His mind and the training of it was just suited to this work of his life. He had good judgment, inexhaustible liking and ability for work, a retentive memory, a quick eye for money values, a peaceable disposition, great caution in undertaking, and pertinacity in accomplishing the exploitation of properties. He made himself personally acquainted with everybody and everything that happened or was likely to happen in the anthracite world, and kept himself in constant intercourse with owners, investors, speculators, mining prospectors, engineers, and railroad companies; and, what was the key to his fortune, never rode hobbies, or allowed himself to be turned aside into other pursuits, although at various times in his life he traveled far to examine and report upon distant coal fields for those who employed him as a professional adviser. I have known, also, of his reports on iron ore properties and oil and gas lands. He was also a great collector of statistics, and was the first to conceive the idea of a statistical coal pagoda, with lines drawn across it at regular intervals to represent successive years, the old legendary 365 tons of anthracite sent to market the first year forming the apex of the pagoda, and its successive stories, bulging or being overhung according as the anthracite market received a greater or less addition to its ever-swelling volume of trade. He was for many years the recognized authority for the statistics of the region.

In 1848, he married Miss Harriet Whitcomb, of New England, and set up his home and office in Pottsville, the capital of the anthracite country. For forty three years this has been his happy, hospitable, and elegant

residence, and here his children, Louise, Arthur, William, and Harry were born and educated, his sons becoming partners in his enterprises, sharing the toils, the responsibilities, and the wealth of their father, and fitted well to maintain the honor of his name.

In 1850 Peter Sheafer took an active and influential part in the effort inaugurated by William Parker Foulke of Philadelphia and other gentlemen to obtain an appropriation from the Legislature for publishing Prof. H. D. Rogers' Final Report on the Geology of the State. Half of the appropriation was to be spent in field work, to bring the Report up to date, especially that part of it which related to the anthracite coal fields. Mr Rogers formed a corps, consisting of Peter Sheafer and his cousin, John Sheafer, for underground surveys, myself for surface topography; Edward Desor, of Neuchatel, for the study of the surface deposits, and Leo Lesquereux, of Columbus, O., for the study of the coal plants. This work only lasted one year, and this corps was disbanded, but a good deal of special work was done in the following year or two in other parts of the State; and the Report did not appear until 1858.

At the organization of the Second Survey of the State, in 1874, Peter Sheafer's business interests were too exacting and important to permit of his taking an active personal hand in it, but he did all that he could to further the interests of the survey at Harrisburg and elsewhere through the following fifteen years of the continuance of the survey; and I am happy to say that the intimate friendship which he and I formed in 1851 was confirmed and continued with unabated cordiality to the present time. His son Arthur was commissioned as Mr. Ashburner's assistant in the long and difficult survey of McKean, Elk, Cameron, and Forest counties, where he exhibited great abilities for field and office work inherited from his father; and the greatest part of the "Report on Elk County," with its illustrations, is from Arthur Sheafer's own pen.

Peter Sheafer was a genial and lovable man, a religious man, and, what always struck me as very interesting, a man of poetical temperament, and a reader of the poets. But he was never properly trained to express his thoughts in a style of elegant composition. His business writings were unexceptionable. His statements of business facts and contracts were satisfactory, but he was unused to a logical, consecutive, well-systematized and picturesque presentation of a subject. This is, of course, to be ascribed to his lack of youthful classical training. I have often thought of him as that one of my friends whose life career best illustrated the advantages and disadvantages of college discipline. For by not going to college he gained more than he lost, and enjoyed great worldly and social prosperity at the very small cost of missing literary facility. I even doubt that the lack of technical school training in his profession as civil and mining engineer was at any time an obstacle in his path of life. He learned enough to join his experienced father in earlier enterprises; and in after ones his intercourse with business men and technical books and

professional experts supplemented his own experiments and kept his intellectual ability abreast of the public needs of each succeeding year.

My friend Sheafer was a silent man, I should say reticent, always smiling and cheery in conversation, but seldom or never allowing even to his enthusiasm more than a momentary flash of expression. He had the confirmed habits of a good listener, and what he himself had to say was said in the fewest words the theme permitted or the occasion demanded. He was intently sympathetic, and loved to hear others talk; his own contributions being chiefly made in the shape of facts No man better appreciated those whom he loved or respected, and this he owed to his poetic temperament

One of the best instances of his ingenuity is his successful device for gobbing up a mine by boring down to its heading from the surface and causing a stream of water to carry down the bore hole the fine slack or braize coal from a neighboring dust hill The coal-mud thus introduced into the abandoned workings is banked back behind loose brattices which let the water flow through but retain the mud, which in some months becomes solid and firm enough to hold up the roof; and then the workings are reopened and the mine is robbed of its pillars. The coal usually lost by the crushing of the pillars is thus saved without danger to the miners; and the country is also saved from caving and settling, which entails a further profit, inasmuch as the coal beds above the one worked out are preserved intact for future mining Schuylkill county ought to erect a statue to Peter W Sheafer for this invention alone.

He became a member of the American Philosophical Society, July 17, 1868 He was a member of the Academy of Natural Sciences of Philadelphia, of the Historical Society of Pennsylvania, of the American Institute of Mining Engineers, and of the American Association for the Advancement of Science His philanthropic feelings induced him to become a member of the American Colonization Society

His death took place at Brown's Mills, Burlington, N J., to which he had been taken from Atlantic City in the hope of saving his life, and he was buried at Pottsville, March 31, 1891

He was six months my senior in age, and now I remain the last one of that old set of the first geological survey of our State. They are all gone—H. D. Rogers, Booth, Fraser, McKinney, Trego, Hall, Boyé, R. E. Rogers, Haldeman, Whelpley, Hodge, Jackson, Henderson, McKinley, Sheafer—not one lives to tell the adventures of those early days of our science, when the very foundation principles of it had to be laid, and the physical constitution of Pennsylvania had to be discovered, without experience and without instruction The bare outlines of the story have been told; but the individual life of that story will never be told; is, in fact, untellable.

Artesian Well in Lowest Trias at Norristown.

Notes by Prof. O. C. S. Carter.

(Read before the American Philosophical Society, May 1, 1891.)

Drilled in the Trias of Norristown, near Stony creek, for water for steam boilers.

15′ Made ground	to	15′
23 Sandstone, light colored, coarse grained, containing fragments of orthoclase feldspar		38
33 Sandstone, dull red, fine grained, with specks of muscovite. Color due to iron oxide		71
31 Sandstone, light pink (produced by pink orthoclase), fine grained, quartz grains transparent, fine specks of muscovite mica		102

Water was struck every ten feet down to 70, none thence to 90; abundance of water between 70 and 102 (located by the driller at 95, 100 and 102); cased at 18 with 6 inch pipe (5⅜ inside). Steam pump furnished 1003 gallons per hour. After pumping 4000 gallons, the level of water in well fell 12 feet; after 7500 gallons, it fell 16 feet and stood.

Analysis of well water gave 11.6 degrees of hardness, as compared with 6 degrees for Schuylkill river water; 14 degrees for English surface New Red water (Wanklyn); and 17 degrees for English deep well, New Red water.

The lime exists mostly as carbonate, with some sulphate, and probably comes from the cement between the sandstone grains.

Another artesian well, situated within a hundred feet of this one, gave water which precipitated in the boilers a fine white powder of carbonate of lime, which did not cake and was easily blown out. This well water is therefore as useful in steam boilers as is Schuylkill river water, and is better, because it holds no mud or sand in suspension. A little soda neutralizes the sulphate of lime. The water also becomes perceptibly softer after continued pumping.

Artesian Well in Lowest Trias, at Norristown.

Well drilled about half a mile from the Trenton limestone, which outcrops at Mogee's Station, on the Schuylkill river, to obtain water for the manufacture of artificial ice.

Cased at 20 feet with 6 inch pipe.

80′ Sandstone, very white and fine grained, containing a little pink orthoclase	to	80′

5'	Sandstone, white, containing coarse fragments of orthoclase	35'
6	Shale, dark red	41
14	Sandstone, white, containing muscovite mica	55
10	Sandstone, lighter color, more feldspathic	65
3	Sandstone, very white, fine grained	68
6	Sandstone, dark red, coarse, containing much iron oxide and a little mica	74
4	Shale red	78
18	Sandstone, red, fine, micaceous	96
4	Shale red	100

Water was first struck between 35 and 40. More than ten "crevices" [probably water cracks] passed between 35 and 100. The water now rises to within 16 feet of surface Steam pump delivers 1500 gallons per hour After ten hours' pumping the water falls only 10 feet in well, the whole fall occurring, however, in the first 45 minutes. With an improved pump 3000 gallons per hour were obtained.

Water Well in Lowest Trias, at Washington Square, Montgomery County

22'	Sandstone, red, micaceous to	22'
12	Clay, stiff, red	34
1	Shale, red (*Trias*)	35

Water first struck at 16 feet, a crevice every 3 or 4 feet; stands at 11 feet from the surface, and never falls lower, no matter how much is pumped, at the rate of 1500 gallons per hour

Artesian Well in Trias, in Worcester Township, Montgomery County, Pa.

Drilled on the Duffield farm, on the north bank of Stony creek, at the crossing of the Stony Creek Railroad, between Custer and Belfry, through New Red (Trias) red shale and clay slates, some of them blackened with coaly matter.

20'	Clay slate, gray, hard, little mica. to	20'
5	Clay slate, *blackened* with coaly matter	25
5	Shale, red	30
5	Clay slate, dark, fine grained.	35
5	Clay slate, very *black*, hard, compact	40
3	Shale, red	43
2	"*Quartzite*"	45
3	Clay slate, gray	48
17	Clay slate, compact, hard.	65

The *quartzite* was said by the driller to be so hard that he could only drill six inches of it in ten hours.

Water was first struck at 30 ; again at 60 ; nowhere else. Water stands at 15 feet of the surface , yields 60 gallons per hour , drops 25 feet after pumping 6 hours.

Evidently the Stony creek water soaks slowly through the bed planes between the clay slates.

Artesian Well in Lower Silurian Limestone, in Montgomery County, Pa

Drilled on Charles Kunkle's farm, south side of the Valley Green road, east of the Bethlehem pike, north-northeast of Flourtown.

40' Limestone, not micaceous, ...	to	40'
20 Limestone, micaceous.		60

Water first struck at 40' , depth of well 60' ; several small "crevices ," water stood at 35 feet beneath the surface, and was not lowered by steam pumping 500 gallons per hour.

Artesian Well in Lower Silurian Limestone, at Parkesburg, Pa.

By Prof. J P. Lesley

Mr P. H. Gibbons, Vice President of the Parkesburg Iron Co., at Parkesburg, Chester county, Pa., was good enough to furnish me by letters dated January 1, February 9 and February 11, 1886, with fragmentary notes of the boring, and forty-five samples for examination, which I have in bottles, the depth in feet recorded on the corks, and finely powdered specimens on glass slides for microscopic use

Soil, first passed through.		18'
Limestone struck	at	20
Quicksand encountered	at	22
Cased quicksand out.	at	24
Limestone ("bastard "), more dense and solid.	to	42
Quicksand again......	at	43
Limestone...	to	58
Quicksand, with flow of water..	at	58
Limestone, purer.....	to	92
Sandstone, yellow, fine grained, 7' thick	to	99
Limestone, of varying qualities, sometimes sandy, "then mica, then lime or marble ;" no water.. ..	to	174
Limestone, of varying nature.	to	323

Specimens examined under the lens, at the following depths :

21' Resembles a sandstone, light gray, with white fracture, some quartz crystals and a show of mica.

22 Same as above, with a trace of iron oxide.

34' Same as above, with an increase of mica.
37 Same as above.
49 Same material, but blackish gray.
60 More carbonate of lime, and some mica, reddish crystals, peroxide of iron.
69 Large percentage of carbonate of lime
79 Limestone
80 Limestone.
85 Quicksand, yellowish white.
90 Same as last.
102 Limestone; mica and quartz in quantity
117 Limestone, reddish.
129 Limestone, bluish light gray, mica
150 Limestone, with yellowish red crystals.
171 Limestone, white, fine grained
179 Same as last.
194 Same as last.
208 Limestone, grayish white.
227 Same as last.
239 Same as last.
255 Same as last.
268 Same as last.
283 Same as last.
298 Limestone, hard. and fine grained, light gray, white
302 Same, increasing in hardness.
308 Same as last.
324 Same, gray and white; show of mica
339 Same, darker gray, more mica
347 Same as last.
360 Same, bluish gray, coarse granules.
372 Same as last
387 Same as last.
404 Same, granules finer; show of mica.
415 Same, grayish white, still finer, less mica.
423 Same as last.
433 Same, dark gray, mica, iron.
448 Same, more crystalline (rhombohedral); more mica.
455 Same, crystalline, dark gray.
464 Same, crystalline, gray and white.
472 Same, fine crystals, light gray.
486 Same, finer granules, very hard, with mica.
502 Same, perfectly crystalline; more mica and feldspar.

One slide prepared to show crystalline forms.

The occasional dissemination of minute flakes of mica and fine grains of feldspar through the limestone is better evidence of the deep-sea

deposition of these Ordovician or Lower Silurian limestone beds than is the silica in quartz form which they contain.

The beds are highly tilted to the south; therefore the vertical hole exaggerates the thickness. The formation is probably "Calciferous" *No. IIa*, but no fossils have been found just here. No record of water obtained.

Artesian Well in Potsdam Sandstone, in Montgomery County, Pa.

Notes by O. C. S. Carter.

Drilled on William Jones' property, near Williams Station, at the crossroads, south of Lancasterville, and east of Spring Mill, the Plymouth Railroad sweeping around it on the southwest.

64′	Sandstone (*Potsdam No. I*), coarse ....to	64′
6	Sandstone, fawn colored, micaceous............	70
10	Sandstone, light brown, fine	80
10	Sandstone, coarse, micaceous, transparent quartz ...	90
22	Sandstone, fine, micaceous......	112
6	Sandstone, very coarse, larger fragments of quartz, with red iron stains	118
4	Sandstone, coarse	122
4	Sandstone, fine, grayish brown....	126
4	Sandstone, coarse, fawn colored.	130
2	Sandstone, fine, resembling ground ginger	132

No conglomerate like that of the Willow Grove Potsdam outcrop passed through; beds tightly laid so that water crevices were few and insignificant. No water struck until the drill reached 60. Water rose and stood at 70. Steam pump delivered only 300 gallons per hour; water falling 10 feet after pumping 10 hours.

Artesian Well of Chalybeate Water, in Chester Valley Clays, near King of Prussia, Montgomery County, Pa.

Notes (condensed) of Prof. Oscar C. S. Carter.

Drilled on William Thomas' land; 90 feet deep; water, deep brown (cider) color, even after 80,000 gallons had been drawn by a steam pump in three days; bubbles of carbonic acid gas constantly escaping; water not clear after standing several days; precipitate, analyzed, was carbonate of iron; precipitation not complete after a week.

35′	Yellow clay.......................................to	35′
10	Layer of rounded pebbles of white quartz, resembling those on the sea shore..........................	45

10′ Fine white sand and pebbles............. .... 55′
10 Blue clay, holding iron balls.. 65
10 Fine yellow clay, holding iron balls 75
Thin bed of solid sandstone which seemed to be *Triassic*, perhaps not *in situ*.
5 feet of Chester Valley limestone (no more limestone) 80
Struck top of *Potsdam S S.* .. .. at 90

Water first struck at about 40′ down; at first, muddy; soon cleared on standing, supply soon exhausted by the pump, merely surface water

No more water until depth of 81′

Chalybeate water at 81′, immediately rose in the dry well to within 32′ of surface. Pumped this water, 60,000 gallons, during 5 days (steam pump) Then iron water exhausted, and clear water took its place. Iron water evidently came from clay beds holding iron balls, some of which were brought up by the drill. Well cased (6″ iron pipe) to 68′.

Water stratum evidently lies between the clays and the rock floor

Artesian Well in the Mica Schist of Philadelphia.

Notes by O C S Carter

Drilled by H W Kelsey, of the Oriental Bath Co, 1104 Walnut street, Philadelphia, for the supply of the baths.

Drillings at every 10 feet examined under a lens; elements arranged below in order of their abundance in the specimen pumping. No rock seen except mica schist and gneiss. Only *traces* of feldspar noticed above 170 Colorless muscovite mica makes all the strata nearly white from 160 to 210 The biotite mica darkens the strata from 210 to 206. *No hornblende seen in any of the pumpings*

20′ Clay, the Philadelphia brick clay. ....to 20′
46 Gravel (thin layer of clay at bottom)..... 66
34 Mica schist, milky quartz, biotite mica, occasional speck of muscovite mica, no feldspar 100
20 Mica schist; muscovite mica and trans. quartz 120
10 Mica schist; biotite, quartz and muscovite. 130
10 Mica schist, quartz, muscovite, some little biotite .. 140
10 Mica schist; biotite, quartz, some little muscovite. 150
10 Mica schist; coarse fragments of quartz and muscovite. 160
10 Gneiss, coarse fragments of pink orthoclase, muscovite and quartz, *first appearance of feldspar* . . 170
10 Gneiss; quartz, orthoclase feldspar and muscovite . 180
10 Gneiss, muscovite, quartz, biotite, little feldspar . .. 190
10 Gneiss; muscovite, orthoclase and quartz....... 200
10 Gneiss; muscovite, orthoclase and transparent quartz 210

10' Mica schist; quartz, biotite, muscovite .... 220'
10 Mica schist; biotite, quartz, muscovite 230
20 Mica schist; biotite and quartz 250
15 Mica schist, biotite, muscovite, quartz 265

Few crevices; strata tightly packed; first rock water struck at 190; rose to 28' beneath surface, pumped 5 quarts a stroke, 80 strokes a minute, 6000 gallons an hour; level falls 20' after one hour's pumping.

Water a little hardened by sulphates and some iron.

Artesian Well in Mica Schist, near Radnor, Delaware County, Pa.

Notes by O. C. S. Carter

Drilled on M. Wheadley's farm, in Chester county, Pa., in the *hydromica schist* of the South Valley Hill belt.

80' Sharp white quartz fragments .. ..to 80'
88 Schist, very micaceous, silver gray, soapy 88

Water crevices struck at 70 and 85; water rose only 10 feet in the well, and stood at 70 feet below the surface, yield, only 120 gallons per hour; drops 5 feet after pumping five hours.

Feldspar Bed in Laurentian (?) Gneiss.

By Prof. Oscar C. S. Carter.

(Read before the American Philosophical Society, May 1, 1891.)

The feldspar quarry is opened on the east bank of the Schuylkill river, between Lafayette Station and Spring Mill, where the Reading Railroad (Norristown branch) and the Pennsylvania Railroad (Schuylkill Valley division) run side by side under the bluff outcrops of syenite and gneiss supposed to be of Laurentian or Archaic age, bordered on the south by C. E. Hall's Chestnut Hill Mica Schist belt of undetermined age.

A small stream cutting down into the Schuylkill just south of the quarry marks the contact of the mica schist and syenite and gneiss belts. About 100 yards north of the quarry is the granite vein described in Prof. H. D. Roger's *Geology of Pennsylvania*, 1858.

The county road runs between the railroad tracks and the bluff, and the feldspar bed is quarried for 85 feet alongside of the road. The feldspar

is also exposed between the road and the railroad for 10 feet more, making the bed at least 45 feet broad, the highest point of rock exposed is 15 feet above the level of the county road.

The dip of the feldspar bed is northward (40°) beneath the gneiss.

The direction of the feldspar bed does not conform to the strike of the belts of gneiss, but, on the contrary, is transverse, *i. e.*, nearly north and south.

The feldspar is orthoclase, of light pink color, with an occasional streak of white granular quartz running through it. Some of the large masses quarried out contain considerable quartz. Large masses of biotite mica are occasionally met with in quarrying, but the occurrence of biotite is not general through the rock

The quarry was opened in the summer of 1888, and about 80 tons taken out and sold to the potteries at Trenton, etc. It is the only feldspar quarry in Montgomery county The quarry in Delaware county is described in the Annual Report of the Geological Survey of Pennsylvania for 1886 A few others, in the States of Delaware, New York, Connecticut, Massachusetts and Maine furnish all the feldspar manufactured into pottery in the United States, the total production from all the quarries, from 1882 to 1887, having been 14,000, 14,100; 10,900; 13,600; 14,900; 10,200 tons, valued respectively at $70,000, $71,112, $55,112, $68,000; $74,500, $56 100. The crude feldspar is valued at the Trenton potteries at about $5 the long ton; and the pulverized feldspar at $11; the quartz being carefully separated out.

A Fragment of Objectionable University-Extension Teaching.

By R Meade Bache

(Read before the American Philosophical Society, May 15, 1891.)

It need hardly be said, and yet, to obviate the possibility of misinterpretation in outside quarters of that which I am about to remark, it becomes necessary formally to declare that I have no intention to depreciate the cause represented by the well-concerted effort of University-Extension teaching to disseminate knowledge heretofore confined to the comparatively few. I would heartily wish that my theme admitted of no mention save of generalities, but thus treated it would not subserve the interest which I would gladly promote, by being brought home to the

minds of my hearers, upon whose individual influence partially rests the benefit which University-Extension teaching is capable of effecting. The attempt to correct incidental error is strictly correlated to endeavor to promulgate the truth, and if it be wise to seek to sow intellectual seed broadcast, then it must also be wise to select it carefully, and to eradicate the tares if any should appear, especially if the soil be virgin, possessing little previous vigorous growth to maintain itself against invasion of injurious crops that haply may be introduced and appear as fruitage of the untried field

I was present on the evening of the 16th of February last, at Association Hall, in this city, at the lecture of Prof Richard G. Moulton, of Cambridge, England, on Dumas' *Monte Cristo* as a companion study to *Prospero*, and there heard his attempt at the demonstration of psychical analogies, similar to those which his Syllabus for other occasions included, between the respectively preternatural and supernatural elements in *Monte Cristo* and *The Tempest*. Yet, although I am a monist, believing that all existences, whether religious, philosophical, or scientific, form one intimately connected and coherent whole in nature, the sole barrier to the just and complete comprehension of which condition lies in the feebleness of the human intellect, I also believe that, perforce of that infirmity, we are constrained to view things in the strictest categories, and that we judge of them only more or less clearly by rigid comparison of their immanent likeness and unlikeness, and hence, although, as was said of Dean Swift by one of his lady-loves, he could write well if he chose to about a broom-stick, it is not, in my view, philosophically permissible to any one to take a broom-stick for a rational flight, and from its suggestion superpose a witch, and with her scale the empyrean, opening up to vision all earthly things below in a maze with relation to themselves and the outspreading heavens.

If by accident, and it was of the purest, for I was invited, and did not go of my own motion to hear Mr Moulton, some of his teachings have become my text, so much the worse for him, or mayhap for me, if I should meet dissent from my propositions. But I make light of the possible consequences to myself, in view of what I deem the justice of my cause. In the interest of that truth which is said to be mighty and always to prevail, of which, however, I have my serious doubts, I speak frankly in

what I deem the interest of Philadelphia, which I love; of literature, which I also love, and of art generally, which has been my never-ceasing pleasure throughout life. Mr. Moulton's merits are enthusiasm and elocutionary ability, his faults extravagance and defective logical perception The result is seen in unbridled imagination soaring over the fields of literature, where, however entertaining, he is not a safe guide to dwellers on the average plane of life in mind, thought, training, and all that goes to form the individual as he stands I proceed, after this necessary preamble, to the discussion of a few statements made by him on the occasion to which I have referred, not relating at all to the point that I have mentioned, but involving what many others as well as myself deem the greatest heresy against tenets fundamental in literature, safely leaving to the sober second-thought and calm review of the literarily educated among his audience the justification of the opinion that I have expressed as to the general tenor and defect of his instruction.

Mr Moulton opened his lecture with the strange remark that, whereas his own regard is especially reserved for literature in itself, doubtless that of the great majority of his hearers was concentrated upon the author This was wholly irreconcilable with the fact of the presence of the large audience that greeted him upon that occasion for the ostensible purpose for which it had assembled Interest in authors, among any portion of the reading public, is always subordinate to interest in literature. That public stands in exactly the same category, if not in exactly the same relation, to literature and authors, as does Mr. Moulton himself. He himself could not, if he would, divest himself of interest in individual authors compatibly with being interested in their works, the one interest with everybody being exactly proportional to the other He protested too much in his intended exaltation of literature, more than it is human to feel, for there is, upon the assumption of individual love for literature, no other category than one inclusive of the highest teacher and the lowliest scholar, in all that regards the relativeness of literature and the author If Mr Moulton's statement were correct, as representing a possible condition of mind, it would be futile to address any mixed audience assembled for literary entertainment and instruction, except by first endeavoring to convert its component individuals from the error of their way of

thinking, that the author is more interesting than his book. But that was evidently not the intention of the lecturer, as set forth in his printed Syllabus of the lecture course, but to make critical study of specimens of the higher literature, upon the assumption of general knowledge of, love for, or at least capacity to learn to appreciate, the productions of master minds in the various provinces of literary art.

A statement in Mr. Moulton's lecture, much more worthy of notice, however, because it involved a dangerous thing to say before a mixed audience, without due qualification to forestall any possible misunderstanding as to the limited reach of the declaration, was contained in his repudiation of all authority for the laws of grammar, clinching the assertion by the remark that in England they do not "set so much store as we in America by Lindley Murray" He declared unreservedly, and proceeded to argue, that so-called laws of grammar are not binding, so repeatedly enforcing the point by using the expression of one of his correspondents, whom he cited as charging that Browning's Caliban "*speaks bad grammar*," as to impress the listener with the belief that he himself regards that expression as good English. That the sentiment was quite agreeable to some scattered groups among the audience was very evident from the gentle murmur of assent and the incipient stir of applause that arose among them. He went on to say that the popular impression that grammatical law is binding arises from confounding two different senses in which the word is used as defining two diverse things. Now, the idea of law, as everywhere apprehended, however imperfectly formulated as a statement of fact or obligation, however even provisional, has, as a term, but one signification Relating to physical phenomena, it contains the affirmation of correspondence between cause and effect, authoritative with man Relating to man, whether as supernally or humanly ruled, it contains the assertion of authority as defining conditions and imposing upon him obedience. Whether, then, the idea is expressed with reference to nature beyond or within man's control, the term corresponds with it, and always relates to that which he regards as authoritative.

Most unfortunate for Mr. Moulton's plea was the distinction which he attempted to draw between legislative laws and the law of custom in language. The essential difference between them,

he affirmed, lies in the fact that legislative laws are imposed by authority under penalty, whereas the so-called laws of grammar, being derived from language, and not it from them, are not of any binding authority whatever. But, just as a general consensus of opinion in a community is by legislative action reflected in the concrete form of legal enactment, so a similar consensus of opinion in a community as to language is reflected concretely in the forms in accepted general usage in speech. Back of all laws of language, as well as of all legislative laws, are mandate and penalty, none the less in the first because they are not there formally expressed. Human laws, whether legislative or otherwise, are, in a word, the expression of the will of the community. The laws of speech, as existing in a particular community, are therefore in their sphere as mandatory as are those of a legislature, nor is their infraction possible without incurring and suffering penalty. Attached to their infraction is the penalty resulting from less comprehensibility in written and oral speech, less ability to secure the widest audience, less possibility of communion with one's fellow-men, and at the lower depths, the absolute impossibility of maintaining the best social status. Because all peoples themselves make language, they cannot be bound by that which they create, is an untenable proposition, seeing that in the evolution of human affairs practice comes first, and then custom, and then the formulation of custom in the unwritten law of precedent, if not in the shape of written law. It is the individual that is bound by the law of grammar as well as other law, not the community creative of correspondent language, and failure to discriminate between the essentially different agencies as, on the one hand, representing authority, and on the other obedience, leads from specious view to specious statement. It may be frankly admitted that Caliban has a right to a grammar of his own, without at the same time admitting that there is no law of grammar, when it is considered that we find all men, up to their individual capacity, using speech with recognition of law incorporate in every individual tongue.

Another unfortunate statement made by Mr. Moulton in the lecture referred to, was when he answered certain criticisms upon Browning, that no matter how he varies his theme, he is generally obscure and ever identifiable through his mask. Mr. Moulton asserted as to these strictures, that every great author

necessarily has his medium through which he must address his world, and it is for his world, if it incline to love him, to study to become familiar with the medium in which the message of the seer is at first enshrouded. But even undeniable greatness in literature, and such is Browning's, does not depend upon obscurity, but must needs be lessened, not increased by obscurity. Neither does personality, inseparable from utterance, enhance, but, on the contrary, it limits literary greatness. Unless we are to renounce existing standards, obscurity cannot be admitted as a merit, but must be recognized as a defect Mr. Moulton mentioned *The Ring and the Book* as perhaps the greatest of all poems, and therefore, inferentially, Browning as perhaps the greatest of all poets The work is marvelously fine, despite fitful, but by no means continuous obscurity, despite portions in which its style is too Hudibrastic to suit the graveness of the theme, and most notably of all (because it might so easily have been otherwise by a halt in time), despite the lameness of its ending. Browning himself says, in the very first line of the superfluous last part of the poem, "Here were the end, had anything an end;" yet relentlessly goes on to reflections of the late actors on the scene, now tame and uninteresting, with even mention that Guido died penitent (with short shrift it must have been, an hour or so at most, including the procession to the place of execution); for which the reader cares not a jot, such terrorized reconciliation of life with death being the common end of darkest criminality in face of unexpected retribution. Fearful is the anticlimax, with its additional Byronic looking towards and mention of the "British Public," when, merely by omission, the grandest possible climax lay just before the author, where the doomed miscreant, Guido, renouncing on the instant his mock heroics and blatant atheism, as he hears his executioners at his cell's door, every shred of pretense falling from his naked hideousness, cries, "Abate,—Cardinal,—Christ,—Maria,—God, . . Pompilia, will you let them murder me?" The tale is told. There is a natural ending, beyond which extension is but injury even the epilogue is out of date. But such things apart, can it possibly be thought as worthy of existence as the first part of Faust, which, if men remain as men now are, must endure until earth, grown cold and lifeless, still rolls on through space. To address his world, a limited world, a less

than the greatest type of author may be obscure and must be personal through his writings, but to address the whole world, to be greatest in literary art, one must so dominate it in clearness and impersonality as though behind the Olympian clouds, where almost alone stands Shakespeare. The grand epic traits of Homer, all but his equal among the immortals, admit of no direct comparison between them, but speaking broadly, there is nothing to choose between them on the score of clearness and impersonality.

It is recognized that what is superlatively great in art is known as such by all orders of men the fact is thus determined Before such works no veil of obscurity hangs, but supreme greatness in them is revealed, if not equally, at least as a presence to all men This law of perception, however, does not exist for science and the highest scientific men. Herbert Spencer has toiled through a long life generally unknown, and wholly unremunerated with this world's goods, although, with well-poised brain and feet firmly set on logical procedure, he has made a march of progress, barring his agnosticism, joined by thousands who have taken fire from his torch to millions beyond unaware of whence came the light. But art is for all the world, by the simple avenues of sense, with much or little intellect, while science, the possession of the few, must ever remain beyond the ken of the multitude save in diluted forms of knowledge. Yet, in entire forgetfulness of the present civilized standpoint in science, Mr Moulton declared that the savage's knowledge of nature far exceeds that of the civilized man. The ground taken for the assertion was the savage's recognized capacity in woodcraft, following trails, and other skillfulness of the most primitive sort, forced upon him by his daily needs, and not to be spoken of in the same breath with the larger acquaintance with nature possessed by civilized man for centuries, especially that represented by the late wondrous civilized advance through study of the highest physical laws.

The *omne admirari* is as pernicious a phase of the human intelligence as is that of the *nil admirari* attitude of mind. To be catholic in taste is not to embrace all creeds and proselytize to every faith To enjoy truly, with exalted sense, is to discriminate. To have the highest æsthetic enjoyment throughout life depends upon holding one's self in the attitude of receptivity for

all that may appeal to one within the present accepted canons of good taste, and beyond, even if it be unfamiliar, for genius is ever enlarging the bounds of taste. The canons of good taste at a given moment of time represent but the evolutionary point of general human advance, beyond which one cannot proceed sanely by leaps, but led by genius, may enter untrodden space beyond. Except the fundamental, there are no absolutely fixed canons of good taste in art but the academical, and they are constantly invaded, for the grand jury of the world is always in session to decide upon works of art, and its decision is final. The life of the individual artist may pass away unrecognized and unrequited, but the span that the longest life compasses is short in comparison with that which may be for all time. To attempt to defend the greatest author at every point, to find no blemish even in obscurity, to make human imperfection flawless, is mistaken zeal. One of the most conspicuous marks of genius is the inequality of its productions. Look for confirmation anywhere, amid many cases that might be cited, to Goethe, to Victor Hugo. In a single work, *Wilhelm Meister*, are to be met palaces and huts, jostling each other What a great gulf divides *L'Homme qui Rit* from *Nôtre Dame de Paris* Compare George Eliot's *Romola*, gem of the purest water, with *Daniel Deronda*, and thence descend in our survey to the depths of ineffable dullness in *The Impressions of Theophrastus Such*. Truly, there is difference in kind between these, making intimate comparison between them impossible; but it is purely between degree as limited by kind as kind that I am instituting the comparison. Is each production of these authors as good of its kind as is another by the same author of a different kind, within its kind, and is not one wholly unworthy of another? that is a fair consideration. Within the very same kind, however (let us put the question to a crucial test), shall we, out of love for Shakespeare, say that even he is always equal to himself? Instance any men and women of genius, and it can easily be shown, if they produced much, that side by side with great performance lies what was beneath their greatness to produce, if it go no further (but it does go much further) than such lapse where even Homer nods. Vainly, because we love an author, would we claim for him equality in all his creation. If so attempting, we really seek to strip him of one of the characteristics that shed, not lustre, but a side-light, on the title to his fame.

Mankind is subject to epidemic crazes of anticipation, admiration and repudiation. The Mississippi Scheme and the South-Sea Bubble, blown to hugest dimensions by the breath of millions, sailed upward until burst by continued puffs of praise. Within a very short period Brown-Séquard, who did not even claim that which the public attributed to him, was raised heavenward, then dropped to earth. Koch was most wisely moderate in statement; all to no purpose when the imagination of the public set sense aflame. Even tulips, two centuries ago, and orchids, but yesterday, have each had with the proverbial dog their little exalted day; that of the dog, as no longer individual, but collective in popular admiration, reigning at present throughout the whole Anglo-Saxon world. In what an unæsthetic general atmosphere of judgment of excellence we live we must perceive upon reflection that, through Jacqueminots, in France, and other types, it took fashion at last to find out, and that but lately, the beauty of the rose. But this especially modern development of factitious rapture is not in the real interest of anything good, least of all in that of cultivating popular taste for art. The best interests of that cultivation lie in appreciative recognition of greatness, though careful discrimination and frankest acknowledgment of imperfections as well as merits in a work of art, while at bottom thankfulness is felt for the gift that has been added to the sum of blessings. It is not ennobling to kiss with equal fervor the clay feet and the golden brow of our idol. Gladly let us welcome him among our household gods; remembering, however, that after all, he is human, but all the more lovable for being so. Let us avoid lauding his imperfections, as did Mr Moulton, when he claimed merit even for the obscurity of Browning, because, as he said, it arises "from excessive sight." The defense is inadmissible; for art depends upon perspective, upon rigid selection, involving therefore exclusion, converging upon finest limitation, resulting in ideal form evolved from void. He who in literature strives at any time to include, or does inadvertently include, in the treatment of a theme, more in quantity or in quality than its development can symmetrically combine, has not then successfully raised the sleeping angel from the block of marble. Virgil, with excessive requirement of his own exquisite skill, well understood the demands of the highest art, when he willed that at his death the work which he had not yet published should perish; for he

as well as others of the ancients knew well, as the French of modern times know and strive to practice, that it is in perfection of *form* that literary as well as all other art chiefly and almost wholly resides; and in literature, unlike other art, which is limited, form includes color, and even the "concord of sweet sounds," and all else that, from delicacy to robustness, through human strength and weakness, appeals to the wide range of affections in the responsive heart of man.

Whoso likes, in poetry or prose, unformed, elusive idea, that sparkles evanescently with promise but half-redeemed in unco-ördinated thought, either enjoys the contemplation of his own profundity, not the author's work, or else is himself so much poet or reasoner that, from fitful gleams of light, as one may think out a whole heaven, inspired by the droning from a stupid pulpit, he shapes to suit his fantasy what, not the bard nor other writer, but his unconscious self lends to the satisfaction of his soul. In either case is self-analysis wanting, which would prove to such misguided beings that works which so inspire are not of art, but of art's inchoate suggestion; a pleasant sketch perchance, but not the finished picture, in which they themselves complete the task, for although in literature the delicately, not the mathematically expressed idea, combines the finest finish with its form, it is also true that in it all should ever tend from airy nothing, not thither to revert, or never issue. Admirably Browning says

> "Fancy with fact is just one fact the more,
> To wit, that fancy has informed, transpierced,
> Thridded and so thrown fast the facts else free,
> As right through ring and ring runs the djerid
> And binds the loose, one bar without a break."

But, just as in all literary art the djerid, *fancy*, is needed truly to bind fact together in all-inclusive bond, so also in all literary art is needed the first of facts, the djerid, *form*, to "bind the loose," in parts and whole, as one "without a break."

A Sketch of the Life of Dr. Gouverneur Emerson.

By W. S. W. Ruschenberger, M.D.

(Read before the American Philosophical Society, May 15, 1891.)

Descriptions of the peculiar attainments of members of the American Philosophical Society, and of their labors to increase and diffuse knowledge of truth of any kind, are interesting features in the Society's annals. For such reason it has long been a practice to have prepared a suitable notice or memoir of every resident member soon after his death.

At the close of his life Dr. Emerson had been a member of the Society more than forty-one years. He was warmly interested in its welfare, and took a more or less active part in its proceedings. Notwithstanding his worthiness of it, a tribute to his memory in the Society has not been recorded.

Just after his death, in 1874, it was suggested that I should prepare a notice of him. Inquiry at the time led to the belief that materials for a suitable memoir could not be easily obtained. Even among his intimate friends, Dr. Emerson was notably reticent about himself, never indulged in reminiscences of his past experience; in fact, his associates knew nothing of his life or career.

Recently, however, his near kinsmen have kindly opened sources of information, and now, after long delay, a sketch of his life and work, in sufficient detail for estimation of his character and measurement of his usefulness while living, is respectfully submitted.

Emerson is an ancient English surname and probably not hereditary.

The Emersons of Delaware sprang from a respectable English parentage, and were among the early colonists of Penn's province. They were all farmers, and proprietors of their farms.

The grandfather of the subject of the following sketch, Gouverneur—familiarly called Govey—Emerson, his wife Sarah, born Manlove, and their six children, were received into membership of the Duck Creek Meeting of the Society of Friends in 1757.* His youngest son, Jonathan, born July 17, 1764, married Ann Bell in 1794.† They had seven children,

* Records of Duck Creek Meeting, Kent county, Del.

† *Genealogical Note.*—Gouverneur Emerson married Sarah Manlove, 1748.

Issue—Jacob, b. 1751, m. Sarah Stout.

Manlove, b. 1759, m. Susan Blundell.

Jonathan, b. 1764, m. Ann Bell.

Robert Bell m. Mary O'Brien of Ireland.

Issue—Henry, Robert, Thomas, John, Mary, Agnes, Lucy.

Henry, m. Elizabeth Lewis.

John, m. Mary Lewis, issue—Ann, Margaret, Mary, Lucy, [illegible], Stephen.

Ann (Bell) m. Jonathan Emerson. Issue—Gouverneur, Sarah (died), Mary, Susan B., Manlove (died) and Ann Eliza.

two sons and five daughters, the youngest of whom is the sole survivor. The eldest of them, Gouverneur Emerson, was born August 4, 1795, near Dover, Kent county, Del. In after-life he remembered with pleasure that when little more than seven years old he was permitted to roam in the woods with a gun.

At an early age he was sent to the Westtown School, a famous boarding school under the direction of the Society of Friends, which was opened May, 1799, in Westtown township, Chester county, Pa. He returned to Dover in 1810, and was for a short time at a boarding school in Smyrna. Thence he was transferred to a classical school at Dover, the principal of which was the Rev Stephen Sykes.

With the preliminary education acquired at those schools, and prompted by his mother, he began to study medicine at the age of sixteen, 1811, under the preceptorship of Dr James Sykes, a prominent surgeon and eminent citizen, who was a first cousin of his mother. Dr. Sykes was once Governor of the State of Delaware, and during many years presided in its Senate *

His father, Jonathan Emerson, died in 1812, leaving his family an ample real estate, consisting of farms and improvements thereon.

Gouverneur continued his study and went to Philadelphia, probably in the autumn of 1813, to attend medical lectures.

His mother, in 1814, married Manlove Hayes, who had children by two previous wives. He was born in 1769 and died in 1849, aged eighty years. The children of his third marriage were Harriet Sykes, Manlove and Charles P., all of whom are living Their mother, a lady endowed with excellent womanly qualities and a strong character, so managed her family that her children and those of her husband were never aware of any difference or preference of kinship, and were affectionate friends during their lives.

Having attended three complete courses of lectures and submitted an inaugural thesis on *Hereditary Diseases*, the University of Pennsylvania granted Gouverneur Emerson, March, 1816, the degree of Doctor of Medicine. He was a member of the Philadelphia Medical Society from 1815, and was elected its Secretary in 1816.

Prior to his graduation he was a private pupil of Dr Thomas Chalkley James, an eminent practitioner, who was professor of midwifery, the first

Ann m (second time) Manlove Hayes, Esq, of York seat, near Dover Del His great grandfather, Richard Hayes, the first *American* ancestor of the family, settled in Delaware in 1698, at the age of 22, and m. Dolly Manlove

Issue—Harriet Sykes, Manlove, Charles P

Mary m 1st Jones, 2d Francis, 3d Edgar

Agnes m James Sykes (a delegate to the First American Congress)

Issue—James, Nancy (who m Commodore Jacob Jones, U. S. Navy), Matilda, John, Harriet.

Lucy m Rev William Magaw, D D, Rector of St. Paul's P E. Church, Philadelphia. Buried under the church

* Biographical Memoir of Dr James Sykes. By Gouverneur Emerson, M D. Journal of the Medical and Physical Sciences, February, 1828

ever appointed, in the University During this association a warm and enduring regard sprang up between them.

Dr. Robert Hutchinson Rose had purchased, in 1809, a hundred thousand acres of wild land,* which included the township of Silver Lake, near Montrose, the capital of Susquehanna county, Pa., and was endeavoring to attract settlers upon it. He and Prof. James were cordial friends. Possibly influenced by the Professor's good opinion of his young friend, Dr. Rose invited Dr Emerson to be his family physician, to become a member of his household, and practise medicine in the neighborhood. Prof James advised him to accept the offer, suggesting in support of his advice, that a settled occupation in the country would fortify his health, which at that time was slightly impaired

Dr Emerson arrived at Silver Lake about the end of September or beginning of October, 1816. He was a tall, slender man just past the twenty first anniversary of his birth, and was, no doubt, hopefully forecasting the future of his career Before he received Dr Rose's invitation he had designed an excursion to the Northern States. After a survey of the position he was to occupy, he determined to delay beginning his work until after he had made his projected journey

In a letter of seven closely written foolscap pages, dated Silver Lake, Dec 5, 1816, and addressed to his friend at home, Alexander L Hayes,† he gives a full summary of his observations during his excursion.

He started alone on horseback from Silver Lake, October 15, 1816, and at the close of the next day reached Unadilla, a New York village, not very many miles beyond the northern boundary of Pennsylvania. There he was not a little surprised to learn that a Philadelphia banknote for $100, with which he had supplied himself to pay his traveling expenses, would be received only at a discount. He was obliged to give that note for ninety dollars in notes of New York banks. Travelers of the present time are not taxed in such manner, because our paper money has the same value everywhere in the United States.

He visited Schoharie, Schenectady, the Balstown Spa, Saratoga, and, passing over the Hudson river at Fish Neck, entered Vermont, From Rutland he crossed the Green Mountains to Montpellier and Danville, passed several days in Southern Canada, traversed New Hampshire and the province of Maine, and returned by the way of Waterford, Troy and Albany, to Silver Lake, after a ride of about 2000 miles.

Having been born and bred in the country, he naturally devotes a large part of his letter to descriptions of the soil and the agricultural value of lands which he saw on his way

* Precisely, 99,200 acres. History of Susquehanna County, Pa. By Emily C. Blackman. Claxton, Remsen & Haffelfinger, Philadelphia, 1873.

† Alexander L Hayes, son of Manlove Hayes by his first wife, was born in Sussex county, Del., March 7, 1793, and was President Judge of the Court of Common Pleas in Lancaster, Pa, from 1833 to 1849, when he resigned, and was again elected 1864 and died in office, 1875.

See, Biographical Encyclopedia of Pennsylvania. Philada., 1874.

In reference to the people he says "The Yankees have a great deal of frankness about them. If they are very desirous of knowing your circumstances, and *of course*, inquisitive, they are willing to tell you their own. Knowledge, religion, civility and money are more equally diffused in New England than in the Middle and Southern States, but there are not as many men of brilliant talents or true piety—more common civility but less polish, and few opulent men, and girls of course. * * * They have a fondness for title and distinction. The most respectable men by far are the tavern-keepers. * * * You will hear that Judge ——— keeps there, and that General ——— five miles this side, and that they are *nice* men; a *nice* man and a fine Yankee are equivalent terms * * * They call all kinds of vegetables sauce."

Dr Emerson, who was probably the first physician settled there, practised his profession at Silver Iake nearly two years.

At the instance of a friend, Mr Andrew Hodge, he was appointed, November, 1818, surgeon of a merchant ship, called the *Superior*, Captain John Hamilton, bound to China

He joined the vessel, which had already dropped down the river, December 7, 1818. The weather was stormy and the wind adverse The *Superior* did not get to sea till the 12th.

The cabin mess, composed of the officers of the ship and three passengers, counted eleven persons, a number quite sufficient to shield them from a sense of weariness or solitude.

Dr. Emerson kept a journal A brief notice of the nature of sea-sickness is recorded the first day at sea.

On the 13th, out of sight of land, a brig from Prince's Island, coast of Africa, bound to Rhode Island, was spoken She had been seventy days at sea and was short of water. As the quarantine laws were then very rigidly observed at Marseilles, the port to which the *Superior* was bound, to avoid risk of vitiating her clean bill of health which might be consequent upon direct personal communication with any vessel or place before reaching Marseilles, casks of water were thrown overboard and picked up by the brig

On the 14th, being then in the Gulf stream, the Doctor notes in his journal the use of the thermometer in navigation

January 26, 1819, the *Superior* arrived at Marseilles, thirty-five days from the Capes of the Delaware.

As soon as the ship entered the mole, the captain went to the Health Office, but was required to remain in his boat outside of the grate, and to throw his papers into a tub of vinegar presented to him, the object being to destroy any contagious matter they might contain. Letters brought for persons on shore, after being cut through in several places to give easy access to the vinegar, were treated in the same manner Every ves sel arriving was required to undergo quarantine. No person was permitted to land, and none to visit her from the shore. A guard was stationed on board to enforce observance of the rules. At the time the plague prevailed in the Barbary States.

"A celebrated Dutch physician, Boerhaave, recommended distilled vinegar as an efficient remedy against putrid diseases. Vinegar was supposed to be antiseptic and therefore protective against all contagions. The hands of those who had to do with contagion were moistened with it, and their clothing and other objects were exposed to its vapors. During the plague of 1720, at Marseilles, it is said that four convicted thieves, who were employed in caring for the sick, protected themselves from the contagion by the use of vinegar, and were granted their lives on condition that they would reveal the means they used to shield themselves in their perilous work. And hence, perhaps, came the preparation called "Thieves' vinegar."

But since modern studies of the processes of fermentation and putrefaction have led to the belief that they, as well as all contagions, are due to the presence of microscopic organisms, vegetal or animal, called mycroderma, bacilli, microbes, etc., vinegar has lost its antiseptic reputation.

Early on the morning of February 4, the Harbormaster came alongside of the *Superior*. Learning from the guard that no one on the ship was sick, he came on board, and, after disinfecting the officers and passengers in the cabin and the sailors in the forecastle, by exposing them to the pungent fumes of oxymuriatic acid gas (chlorine), he granted *pratique*, *i. e.*, liberty of the port. Then the ship was moved to the vicinity of the Custom House, and the gentlemen found quarters at the Hotel des Ambassadeurs.

After a sojourn of two months at Marseilles the *Superior* sailed April 8, and on the 15th anchored in Gibraltar bay, and was detained some time in quarantine, and afterwards many days waiting for a favorable wind. Before daybreak, May 6, 1819, the anchor was weighed and on the 7th the ship was fairly at sea.

August 1, the ship was anchored at Angier, Java, and on the 3d proceeded on her way. The anchor was let go again, Aug. 20, off Macao, where merchant ships bound to Canton were detained twenty four hours. In the afternoon of the 21st a passport to proceed up the river was granted and a pilot sent on board. The ship started about half past three o'clock P.M., and anchored in the Bocca Tigris sometime after midnight. The pilot landed the next morning to exhibit at the fort there the "chop" or permit to go up the river, and brought back two pilots and two Mandarins to remain on board till the ship reached Whampoa, the common anchorage of foreign ships trading at Canton. It is sixteen miles below the city. The *Superior* anchored in the evening of the 23d, and on the 26th, Dr. Emerson and fellow voyagers were lodged in Swedes Factory at Canton.

In a letter to his mother, dated November 5, 1819, Dr. Emerson says: "After the first impressions of the abundant novelties wore off, the dull uniformity which followed became tedious, and time now appears to fly slowly."

He relates that in consequence of drinking Samshoo, a liquor prepared from rice, which in excess produces a fierce, maniacal intoxication, the crew of the *Superior* mutinied, and, in the absence of the captain, endeavored to kill the officers and take possession of the ship. Officers of other vessels lying near, immediately joined in the conflict. Some of the crew were knocked down and others stabbed. Eight of the ringleaders were put in irons, and fed on bread and water for ten days, and under such treatment became as subordinate as they always had been.

He gives account of an accident to himself which might have been serious, as follows:

"I went on board a ship where they kept a Spanish bloodhound. He was tied before I went on deck, but while sitting in conversation with some of my friends, he broke loose and sneaking alongside leaped into my face. The damage I sustained was a wound through the left lower eyelid, a deep cut on the temple, and one under my shoulder, together with a very black and inflamed eye, from all of which, I am happy to inform you, I have recovered. The dog is the most savage of his species. I escaped *very well considering*. He has injured others more seriously."

Referring to mosquitoes, he says: "I sleep under a net which lets the air circulate, but keeps out every kind of insect. You will be pleased to see it. I think the plan so ingenious and good that it will be adopted by many of our friends."

A plain implication from the Doctor's remark is that the mosquito net was a novelty to him in 1819, and not known in the neighborhood of his native place. Are we indebted to the Chinese for this invention?

The party finally left Canton for Whampoa, Nov. 22. The ship had been moved below the common anchorage when they reached her about noon. She arrived at Lintin on the 23d, and there found the U. S. frigate *Congress*, Capt. John D. Henley, said to have been the first American man-of-war to visit China. She anchored here Nov. 3, with many of the crew suffering from dysentery, ascribed to the water taken on board at Angier. Her presence aroused the suspicion of the Chinese authorities that it meant no good, and therefore they would not allow provisions to be furnished to her from Canton. The *Superior* brought several barrels of bread for her use, and other American merchantmen conveyed to her barrels of beef and pork.

On the 26th Nov. the *Superior* sailed from Lintin homeward bound.

On Saturday, Jan. 16, 1820, then in the Indian ocean, she was boarded from a Patriot privateer, said to be two months out from Buenos Ayres. She was armed with sixteen guns and had a crew of two hundred men.

Dr. Emerson, in his journal, says: "We first discovered her on Friday morning, about three miles off our starboard quarter, standing on the same course. The wind was light and unfavorable; a high head swell further impeded our progress. Towards night the strange sail had gained upon us. We thought she showed a desire to speak. Every precaution seemed to have been taken to disguise her real character, by carrying

little sail, but we still suspected her of foul intentions. The night was dark, but she kept close to us and always in sight. In the morning, being off our weather quarter, within gunshot, she ran up a Spanish flag and fired a gun to bring us to. When close to us she backed her topsails, hauled down the Spanish and ran up the Patriot colors, at the same time opened all her weather ports, ran out her guns and brought her whole broadside of eight guns to bear upon us. The star-spangled banner floated over our quarterdeck.

"We now thought ourselves in a rather unpleasant situation. Although no declared enemy, still the many outrages and piracies under what was called the Patriot flag made us fear we might not fare better than others under similar circumstances.

"Her boat, rowed by a set of cutthroat-looking fellows, came alongside. The officer, apparently of inferior rank, wore a belt full of pistols and daggers. He was without a coat and barefooted. A renegade American attended him as interpreter. Having noted the ship's name, the latitude and longitude, etc., this accomplished officer directed his attention to our breakfast table, at which we had just intended to sit down. After refreshing himself and companions, the work of plunder began. They robbed us of many barrels of beef, pork, bread, butter, tea, silk, canvas, iron kettles, live stock, etc. The villains seemed to think themselves as fairly entitled to what they took as if they were purchasers. Whenever they came across anything they fancied, they said with all effrontery imaginable, 'Half for us and half for you,' adding from time to time, by way of consolation, 'We don't want to do you any harm.'

"They stated that they had a great deal of sickness on their ship and were throwing men overboard every day. They tried to induce me to join them, offering any rate of wages I might ask. They had a surgeon, but he was so indifferent that if in my way they would throw him overboard, and so get rid of him. His pay was a hundred dollars a month, but they would allow me any price I asked. Having consulted among themselves aside, they said that they had agreed not to force me to go with them against my will, although they were so much in want of medical assistance. According to their account the prevailing diseases on board were scurvy, dysentery, fever and ague, which had reduced what remained of the crew to a deplorable condition. Receiving a decidedly negative answer from me to their invitation, they next demanded a supply of medicines. I gave them some of a common kind, such as I thought might be useful to the wretches. The suspicious rascally officer took some of each one on the point of a dagger and thrust it into my mouth, watching me intently all the while, not satisfied till he had seen it on my tongue. This experience reminded me of a ludicrous scene in the "Honeymoon," where the doctor is forced to take his own medicine or be thrown out of the window.

"Though they robbed us in this unwarrantable manner, we were not treated as badly as we had expected. A strong breeze sprang up which

prevented their small boats from passing between the two vessels. They permitted us to make sail, but followed in our wake The breeze stiffened to a gale. Night came, dark and stormy. We changed our course On the following morning, to our great joy, nothing was seen of our pirati cal friend "

March 20, the *Superior* was boarded by a Delaware pilot, and in the evening of the 23d reached Chester, 117 days from Lintin The ship had been absent from Philadelphia sixteen months.

His journal during the voyage contains testimony of industrious study and intelligent observation of all things at sea or on shore that impressed their images on his mind. Marine animals and aquatic birds, wherever they appeared were described. Drawings of some were made Those and original sketches of places seen, and maps of ports visited, with now and then an apt quotation from some poet, illustrate his pages.

He gives detailed accounts of what he saw at Marseilles and on his way to it Whatever was new to the young traveler seemed to be charming Appearances of people and things, famous localities with their historical associations combine to quicken curiosity and impart a glow of interest to his record of pageants viewed, of visits to hospitals, public buildings, theatres, museums, etc Days were passed at Aix, St Remy, Nimes, Avignon and Vaucluse Many pages are given to descriptions of the remains of ancient Roman buildings, and of whatever interested him in those places

He gives interesting accounts of Gibraltar, and describes a visit with a companion on horseback to Algeçiras, a port of Andalusia, six miles west of the famous fortress.

At Angier, in the Straits of Sunda, he tells of the many canoes and boats which came to the ship with fowls, fruits in great variety, vegetables, Java doves and Java sparrows in little bamboo cages, monkeys, paroquets, sea shells, and animals of the deer kind not taller than our domestic cat, and all being at moderate prices found ready sale among strangers The natu ral, corporal characteristics of the Malays, seen here, their costume, language, as well as the appearance of their dwellings on shore, the mountain scenery, tropic vegetation, and political condition are sketched and commented upon

Macao, Whampao, Canton, Lintin, pagodas, scenery and Chinese boat population along the river are in like manner noticed in detail

The instruction derived from his observation and study, and the forma tive influence of his experiences during those months of separation from home, may not be definitely measured, but possibly to his alert mind they were as effective as the training of a college course

With such preparation for work, on the 4th of August, 1820, the twenty fifth anniversary of his birth, Dr Emerson settled himself at No 37 Chestnut street, Philadelphia, ready to give professional attention to any who might ask it. Possibly the time might have been opportune to introduce a young physician to business Thirteen deaths from yellow

fever in the city had been reported during the season of 1819. The circumstance had created a vague apprehension of its recurrence, and may have induced people to appreciate practitioners of medicine more highly than when there was no prospect of needing them; and consequently, new candidates for practice might be more promptly noticed. The apprehension was realized to some extent, during the autumn of 1820, seventy-three persons died of the disease in the city.

Dr. Emerson was appointed an attending physician of the Philadelphia Dispensary, September 19, 1820, and resigned the office, May 21, 1822.

The City's Councils elected him a member of the Board of Health, March 12, 1823, and the Board appointed him its Secretary the same day. It is conjectured that he resigned three years later.

Prevention of the introduction and spread of smallpox in the city at that period attracted attention. Between January, 1818, and December, 1823, five years, only nine deaths from smallpox in the city had been reported. Fear that the disease might again enter the city was no longer manifest. For this reason it was supposed that vaccination had been generally neglected in the community.

The Board of Health was without authority to enforce measures to prevent the spread of the disease, then present, and for this reason its members were not willing to act, but at the instigation of Dr. Emerson the Board announced in the daily newspapers, three times, that smallpox was in the city and recommended all unprotected persons to be vaccinated without delay. The same year, November 15, 1823, the Board again warned the public of its danger, saying, "And as it is believed that there does exist among some an unjust prejudice against the practice of vaccination, the Board conceives it a duty to declare that the evidence afforded by our city in its long exemption from smallpox, together with the happy results which have followed the introduction of vaccination in all parts of the world, ought to be sufficient to convince the most incredulous of the salutary influence of this inestimable preventive."

Dr. Emerson submitted to the Board for approval and transmission to the Legislature a draft of a law and memorial on the subject. The proposed law in substance provided that vessels having smallpox on board should be quarantined on arrival in the same manner as those affected with other contagious diseases, that inoculation of smallpox should not be practised in any case without the sanction of the Board; and that authority already conferred on the Board of Health to deal with contagious diseases specified should be extended to smallpox.

After debating the subject at several meetings, the Board approved the memorial and draft of the proposed law, January 28, 1824, and transmitted them to the Legislature then in session. Although 160 deaths from smallpox had occurred in the city during 1823, a member of the House of Representatives retarded its action on the bill after it had passed the Senate by securing a seemingly innocent amendment to it, but which in fact provided that appointment to offices connected with the Board of Health

might be so made as to reward political and partisan services without regard to fitness of the candidate.

Mr William Binder and Dr Emerson were sent to Harrisburg to point out the effect of the amendment, and at the end of four days' work they secured its rejection and the enactment of the original bill A copy of the act was duly delivered to the Board of Health, April 7, 1824

His work as a member of the Board of Health, and his communications to the newspapers pointing out the risk of permitting those affected with smallpox to freely mingle with citizens, bear witness to Dr Emerson's disinterested benevolence

During 1824, deaths from smallpox in the city numbered 325. They were reduced to six in 1825, and to three in 1826 But these facts are not conclusive that the measures taken by the Board of Health during this period contributed to abate the prevalence of the disease, because, both prior and subsequent to this time, the rate of mortality from smallpox in the city, between 1807 and 1840, fluctuated in the same striking manner, as Dr Emerson shows in his papers on *Medical and Vital Statistics*, published in "The American Journal of the Medical Sciences," November, 1827, November, 1831, and July, 1848.*

Dr Emerson published in "The Journal of the Medical and Physical Sciences," February, 1823, a brief and interesting memoir of Dr James Sykes, who was his first preceptor in medicine, and a charming biographical memoir of Dr. Samuel Powel Griffitts, in the "North American Medical and Surgical Journal," in 1827

July 6, 1832, Dr Emerson, accompanied by Dr Isaac Hays, visited the first case of "spasmodic cholera" that occurred in the city, his original description of which is in his commonplace book

The disease became epidemic Deaths from it numbered 1021 Dr Emerson had charge of the Hospital for Orphans As a token of appreciation of his service during the epidemic, a silver pitcher was presented to him, upon which is inscribed

To
GOUVERNEUR EMERSON, M D,
The City of Philadelphia,
Grateful for his disinterested and intrepid exertions,
In a period of public calamity
—— o ——
Transeat in exemplum

He lectured in the Franklin Institute of Pennsylvania in 1833, on meteorology, and in 1834, he delivered another course on heat, electricity and galvanism, in connection with the subject.

* Mr Pliny E. Chase reported at a meeting of the American Philosophical Society, February 5, 1869, and subsequently published, his *Comparative Statement of Mortality in the Society of Friends and that of the General Population of the City of Philadelphia from 1800 to 1868*, which, he states, was compiled largely from Dr Emerson's papers.

Dr Emerson was chosen to be a member of the American Philosophical Society, April 19, 1833. At stated meetings he made many brief communications on many subjects, which are recorded in Vol i to Vol xvi of the published Proceedings.*

He was one of the Councilors of the Society during ten years, from 1837 till the end of 1846

He delivered a lecture *On the Advantages Derived from Cultivating the Arts and Sciences*, before the Philadelphia Mercantile Library Association, in the hall of the Musical Fund Society, December 8, 1880

Among other points of interest, he states that the first successful attempt to cross the Atlantic in a vessel propelled by steam was made in a steam ship called the *Savannah*, commanded by Moses Rogers, a native of Connecticut, but long a resident of Philadelphia. He sailed from New York, March 28, 1819, and arrived at Savannah, Ga., April 6, whence, after some delay, he crossed the ocean and arrived at Liverpool, June 20, having used steam or sails, as the wind permitted From Liverpool the *Savannah* went to Elsineur, Stockholm, Cronstadt, St. Petersburg and Copenhagen She then returned to Savannah Ga., and thence went to Washington, D C Thus the practicability of crossing the Atlantic in a vessel propelled by steam was first demonstrated by an American.

In this connection he relates how Thomas Godfrey, an obscure citizen of Philadelphia, from a casual observation of the reflection of light, perceived the principle upon which he constructed, in 1730, the mariner's quadrant, and how he was robbed of the credit of his invention, and claims that Godfrey is entitled to "the lasting gratitude of all concerned, either directly or indirectly, in nautical pursuits, by inventing the only instrument that can securely guide the ship when far from land," and they should not permit only "a fragment of the most perishable stone" "to mark but for a few years longer the grave of Godfrey"

This appeal induced members of the Mercantile Association and others to construct a suitable monument to Godfrey's memory

* The subjects upon which he made oral or written communications are as follows

The production of electricity from the animal body, the production of electricity from steam observations on Mower's paper on meteorology, excessive mortality of male children, effects of hot weather on infants, causes operative in changing the proportions of the sexes at birth, importance of phosphoric acid in agriculture, phosphorescent light produced in the diamond by friction the compound action of the mental and optical faculties concerned in vision cultivation of cotton in the Northern States, cleaning flax fibre for market, extent of propagation of atmospheric vibrations produced by explosions of powder, manufacture of the sugar and syrup of sorghum, imphee, or African sugar cane and cultivation of sorghum, improvements in Whitney's cotton gin; Robbini's process for preserving wood from decay by injecting into it vapor of coal tar, remarks on the part taken by the American Philosophical Society in connection with the Franklin Institute, to establish stations for meteorological observations; earthquake of October 20, 1870, reported November 4, 1870, as to expanse over which shocks were noted, lunar influence on wet and dry weather, ascription of the gradual translation of the peach-tree belt southward on the Atlantic coast to the progressive removal of the forests, causing exposure of the fruit trees to severe climatic fluctuations.

The closing paragraph of this interesting lecture is here cited as a fair sample of its style and tone

"I hope I have said enough to prove that for prosperity and security, nations are mainly dependent upon the intellectual capacities and acquirements of their citizens. We have never known or heard of one that has not experienced its days of trial, and it cannot be supposed that our own country, whose hills and valleys now rejoice in the possession of peace and abundance, can always be exempt from calamity If ever driven by adverse fortune to fearful extremity, happy will it be for her, if, in that day, like France at the crisis referred to, or like England—sustained during her long and dreadful conflicts by the resources furnished through her Watt—be rescued by her philosophers! Let us, therefore, like France, and the mighty people from whom we chiefly spring, use all our efforts to foster and diffuse the arts and sciences, and to banish the word *impossibility* from our vocabulary"

Dr. Emerson delivered an address, June 1, 1843, at Laurel Hill Cemetery on the completion of an unostentatious monument erected to the memory of Thomas Godfrey

The reason for this tribute is stated in the address, substantially as follows

One day while an ingenious young man, Thomas Godfrey, a glazier, was replacing a pane in a window on the north side of Arch street, opposite to a pump, a girl after filling her pail placed it on the sidewalk Turning towards it he saw that the image of the sun was reflected from the window into the bucket of water, and from it back to his eye * This simple observation led him to study the law of the reflection of light, and to invent a quadrant with speculums to take the distances of stars which he supposed might be of service at sea. The same year, 1730, he had made his reflecting instrument † One was taken to the West Indies and used during the voyage to ascertain the latitude. It was brought back to Philadelphia before the end of February, 1731 The practical value of the instrument was thus demonstrated

Although James Logan, in May, 1732, described the mariner's quadrant constructed by Godfrey in a letter to the celebrated mathematician, Dr. Edmund Halley, then President of the Royal Society of London, he did not obtain credit for his invention It is believed that Dr Halley

* John F Watson, in his "Annals of Philadelphia," states this incident somewhat differently According to his account, which seems to be accurate, Godfrey was glazing at Stenton the residence of James Logan, and noticed the reflection of the sun's image from the window to a piece of fallen glass and from it to his eye He immediately went into Mr Logan's library and took from the shelf a volume of Newton's works to consult. Mr. Logan entered almost at the same time, and asked him the object of his search, and was much pleased with Godfrey's ingenuity, and from that time became his zealous friend.

In those days glazing was done by soldering the panes into the frame work Glaziers were also plumbers, and did not paint.

† He lent one to Joshua Fisher for trial in his surveys of the Delaware See Watson's "Annals of Philadelphia."

suppressed Mr Logan's letter, and communicated the description of Godfrey's quadrant to Hadley, a mathematical instrument maker in London, who after making slight mechanical changes in the instrument, obtained a patent for it. In this way Godfrey's invention came to be unjustly called Hadley's quadrant

Dr Emerson establishes Godfrey's right to priority of invention on the testimony of James Logan, Benjamin Franklin, Peter Collinson and others

Thomas Godfrey was born in Bristol township near Germantown, on his father's farm of 150 acres, in 1704, and died in 1749, and was buried there.* He was fairly educated, and was a member of Franklin's famous Junto He taught himself to read Latin

Mr John F Watson, the annalist, convinced of the wrong done to Godfrey, sought his grave ascertained the inscription which had become illegible on the gravestone, and in 1838, at his own expense, had the remains with those of his wife, father and mother transferred to Laurel Hill Cemetery

The Mercantile Library Association and certain inhabitants of Germantown jointly contributed means to erect a monument to Godfrey, the completion of which was the occasion of Dr Emerson's address.

Possession of several hundred patrimonial acres in Kent county, Del., accounts for his attention to agricultural affairs He made numerous and extensive experiments to ascertain the comparative value of different fertilizers He erected a building on Frankford creek, Philadelphia, in which was manufactured, under the direct management of a Frenchman named Jourdan, a fertilizer called Jourdan's phosphate. This product was extensively used during several years. In 1844 or '45, two tons of Peruvian guano were brought to Philadelphia as a sample. At his suggestion he and his friend, Mr D B Cummins, purchased each a ton and introduced it to the farmers of Delaware. On one of his farms he constructed a mill for crushing bones by horse power The work was imperfectly done; but by treating the crushed bones with sulphuric acid and mingling the product with ashes and fine earth a fertilizer was produced which proved to be a good substitute for Peruvian guano, and cost much less. By observation and experiment he ascertained, in 1849, that the delightful and peculiar flavor of our so-called grass butter is due to the sweet scented vernal grass—*Anthoxanthum odoratum*—which flourishes in pasture fields till about the end of May, and upon which the cows feed He obtained from this sweet vernal grass an essential oil, and ascertained that it contains *benzoic acid*, upon which its flavor depends, and that a small quantity of benzoic acid administered to a cow imparted to the butter made from her milk the same flavor it has while sweet vernal grass forms part of her feed.† He delivered appropriate addresses before horticultural and agri-

* Watson's "Annals of Philadelphia."

† See Letter Oct. 31, 1849, from Dr Emerson to the Commissioner of Patents. Report of the Commissioner of Patents for the year 1849, Part II—Agriculture—pp. 372-75.

cultural societies at several places in Delaware and Pennsylvania, and published a pamphlet on the cultivation of cotton in the Middle States. He edited *The Farmer's Encyclopedia and Dictionary of Rural Affairs*, an octavo volume of 1178 pages, illustrated by seventeen plates, which was published by Carey & Hart, in 1844 In adapting it to American use Dr Emerson added to the original English text about thirty per cent. of the volume.

Although attentive to whatever related to agricultural improvements, he was seriously interested in medical affairs

In 1845 the New York State Medical Society invited the medical institutions of the country to appoint delegates to meet in the city of New York on the first Tuesday of May, 1846, and form a National Medical Convention to devise measures to promote the common interests of the medical profession and improve medical education Many prominent physicians, representing medical bodies in different parts of the United States, were present Dr Emerson, one of the delegates from the Philadelphia Medical Society, was with them

On organizing the meeting it was found that 133 delegates from medical societies in sixteen of the twenty-nine States were duly accredited, and that seventy-five of them were from New York This partial and unequal representation led a delegate to propose that the Convention should at once adjourn *sine die* His proposition was not accepted After due deliberation officers were elected, and committees were appointed to prepare a plan of organization, etc , and among them a committee to prepare a code of medical ethics to govern the medical profession of the United States. Dr Emerson was appointed a member of it

The several committees were instructed to report at a meeting of the Convention to be held on the first Wednesday of May, 1847, in Philadelphia

The National Medical Convention met at the appointed time, May 5 Of 239 delegates elected to it from twenty-two States, including the District of Columbia, 175 were present

The committees appointed in New York presented their reports, which were duly considered

The Convention, by a resolution adopted May 7 became the American Medical Association The new organization elected officers, appointed standing committees and adjourned to meet in Baltimore on the first Tuesday of May, 1848.

Dr. Emerson participated in the creation of the American Medical Association. In a note written by him on the cover of a copy of it, he claims that the Code of Medical Ethics was compiled exclusively by Dr Isaac Hays and himself The Association still holds its annual meetings, always to the advantage of the medical profession, and is recognized as authority on questions of medical policy in the United States.

Dr Emerson was a member of its first Committee on Publication, 1847, and served on till 1853, of the Committee on Medical Sciences, and con-

tributed to its report of 1850, Vol III, pp 91-94, "Observations on Vital Statistics;" of the Committee on Hygiene, 1851; and of the Committee of Arrangements 1855.

Dr Emerson was elected a fellow of the College of Physicians of Philadelphia, February, 1847 He never contributed to its Transactions. He was elected a delegate from the College to the American Medical Association in 1849, and in 1856, and to the National Quarantine and Sanitary Convention in 1857, and 1858

He was a member of the Academy of Natural Sciences of Philadelphia from August, 1858; of the Philadelphia County Medical Society from 1857, of which he was President, and of the Medical Society of the State of Pennsylvania.

Dr Emerson's medical practice from about 1828 to 1840 was lucrative and extensive His interest in agricultural affairs, always notable, gradually increased with the lapse of time, and his interest in medical affairs gradually abated till he relinquished the practice about the year 1857.

Dr Emerson, by invitation, began to live with Mr Henry Seybert, at No. 926 Walnut street, in May, 1856 Apartments in the house were assigned to each proportionately. Dr Emerson was the caterer, though they did not mess at the same table, and kept a detailed account of the household expenses which were periodically and equally shared They lived together in perfect harmony eighteen years—till Dr Emerson died

Mr Henry Seybert and Dr Emerson were warm friends. Their close association is notable because their pursuits and aims in life were wide apart. Their mental characteristics were quite different. They were alike in condition Both were unmarried, and both in easy circumstances. In some respects their tastes and ways were the same, simple, economical

Dr Emerson had a working knowledge of botany, mineralogy, geology and physics Mr Seybert had been educated in Paris, and trained in the School of Mines to be a chemist and mineralogist, and after his return home did some good work In these scientific paths they were congenial. But Mr Seybert was deeply imbued with religious sentiment.

While he was in Paris mesmerism attracted public attention, and he became interested in spiritualism

He had read that "it is easier for a camel to pass through the eye of a needle than for a rich man to enter the kingdom of heaven" His construction of this sentence made him unhappy. He was so much tormented by the thought that all his attempts to lead a good life were useless as regards *future* existence because *he was rich*, that he consulted pious men on the subject, and among them the Archbishop of Rouen By them he was assured that the sentence was addressed to the *sinful* rich *only*, and not to those who gave of their goods liberally to the poor * Whether his many charities were prompted more by disinterested consideration for others than by this assurance is conjectural Be this as it may,

* Obituary Notice of Henry Seybert, by Moncure Robinson. Read before the American Philosophical Society, Oct. 6, 1883

Mr Seybert was known for his charity and public spirit,* but most distinguished by his deep interest in a supposition or doctrine that after death and disintegration of his body by natural decay or cremation, a man's soul, wearing the carnal appearance of himself may, at any time, be made manifest to the living through the medium of specially endowed persons, and in this manner communication with the world of spirits may be held In this modern spiritualism he was a staunch believer Shortly before his death he gave to the University of Pennsylvania $60,000 to found a chair of philosophy, on condition that the University should appoint a commission to investigate "all systems of morals, religion or philosophy which assume to represent the truth, and particularly of modern spiritualism." †

While Mr Seybert was engaged in the study of spiritualism, Dr. Emerson, who had no respect for his friend's belief, was occupied in endeavoring to improve agricultural methods and in cultivating his several farms in Delaware

His mother, Mrs. Ann Hayes, died in 1863, aged 86 years. Her long life was exemplary in every sense, unselfish and continuously kind and charitable The positions occupied by her children are significant of the mother's attention and care for their welfare. To her Dr Emerson late in life ascribed his first love for the British classical writers.

Society in Philadelphia was discordant at the outbreak of the great Rebellion, because the interests and affiliations of many of its residents were in the South and with the rebels. Those persons were openly defiant, threatening and at times belligerent To determine if possible who were and who were not to be trusted, a few loyal men held midnight conclaves

* Among acts which may be ascribed to his public spirit was Mr Seybert's unsolicited gift to the city He substituted a new for a good old clock and bell which had long well served to ring out the hours, joyful news as well as alarms, from the State House steeple to very far-off dwellers in the city Unexpectedly the sound of the Seybert bell is comparatively very feeble, scarcely audible more than 500 feet in any direction during the busy hours of the day, or at any time when there is a moderate breeze

In the following humorous stanza, its author makes use of this circumstance to contrast the "clash and jingle" of St. Mark's chime of bells which greatly disturbed the neighbors at the time

"There's a bell whose swinging gives out no ringing,
And I hear no dinging in the State House yard,
And where its rolling looks like tolling
I stand and tremble lest my hearing's hard,
For, with steeple rocking and hammer knocking,
And people mocking,
I hear no more
The low dull mutter
Those dumb lips utter
Than the stone Washington before the door"

† Preliminary Report of the Commission appointed by the University of Pennsylvania to Investigate Modern Spiritualism, in accordance with the bequest of the late Henry Seybert (page 5) J B. Lippincott Company, Phila., 1887

Henry Seybert died March 3, 1883, aged 81 years.

which ultimately resulted in the organization of the Union League of Philadelphia, December 27, 1862, the members of which were pledged to "unqualified loyalty to the government of the United States and unwavering support of its efforts for the suppression of Rebellion" *

Dr Emerson, who was elected a member February 18, 1863, daily visited the Union League and participated in its proceedings till the end of his life.

Dr Emerson did not devote his time and thought exclusively to the practice of medicine and agriculture. He was interested in questions of political economy, social science. He translated the second edition of Le Play's "Organization of Labor," a learned and valuable contribution to the literature of the subject This work, the last from his pen, was published in 1872

He died very suddenly in his office, July 2, 1874, near the end of the 79th year of age His grave is next to that of Thomas Godfrey, Laurel Hill Cemetery

He bequeathed his ample estate, including several farms, which together contain more than a thousand acres of arable land in Delaware, to his kinsmen

His long life was virtuously spent, and so far he was above the bulk of mankind Seemingly always under the influence of his early Quaker training by his mother, never manifesting the least pretension to piety, or solicitude about his future existence, his daily conduct was shaped in obedience to the precepts of the Decalogue and of Christianity Naturally modest and considerate of the rights of others, he was never aggressive. A dignified and courteous demeanor, varied attainments and the easy flow of his conversation made him a welcome and frequent guest in the society of good and cultivated people.

A genius for persistent labor never permitted his talents, which were far above the average, to be idle. His career was marked by habitual industry and useful work rather than by special achievement in any of his pursuits. Though not a discoverer, or a great leader in science, his exemplary conduct and benevolent labors entitle him to general approbation, and his memory to our kindly respect.

Appendix

A list of Dr Gouverneur Emerson's publications :

"A Biographical Memoir of Dr James Sykes, February, 1823." "Chapman's Journal of the Medical and Physical Sciences."

"Biographical Memoir of Dr Samuel Powel Griffitts, 1827." "The North American Medical and Surgical Journal"

"Medical Statistics, being a Series of Tables showing the Mortality in

* Twenty fifth Anniversary of the Organization of the Union League of Philadelphia, December 27, 1887 Press of J B. Lippincott Company, Philadelphia, 1888.

Philadelphia and its Causes" "The American Journal of the Medical Sciences," November, 1827.

"Medical Statistics, consisting of Estimates relating to the Population of Philadelphia, with its Changes as Influenced by the Deaths and Births during Ten Years, viz., from 1821 to 1830 inclusive" "The American Journal of the Medical Sciences," November, 1831.

"Vital Statistics of Philadelphia for the Decennial Period from 1830 to 1840." "The American Journal of the Medical Sciences," July, 1848.

"Lecture on the Advantages Derived from Cultivating the Arts and Sciences" By G Emerson, M D. Delivered before the Philadelphia Mercantile Library Association, in the hall of the Musical Fund Society, December 9, 1839. Printed by A. Waldie, Philadelphia, 1840

"An Address delivered at Laurel Hill Cemetery on the Completion of a Monument Erected to the Memory of Thomas Godfrey, June 1, 1843" By G Emerson, M D

"The Farmer's Encyclopædia and Dictionary of Rural Affairs, embracing all the most recent discoveries in agricultural chemistry, adapted to the comprehension of unscientific readers, illustrated by numerous engravings of animals, implements and other subjects interesting to the agriculturist." By Cuthbert W Johnson, Esq, F R S, Barrister-at Law, Editor of the "Farmer's Almanac," corresponding member of the Agricultural Society of Edinburgh; the Horticultural Society of Maryland, etc Adapted to the United States, by Gouverneur Emerson 8vo, pp 1173. Carey & Hart, Philadelphia, 1844

'Address delivered before the Society for Promoting Agriculture of the County of Philadelphia, at their Annual Exhibition, at the Rising Sun Tavern, October 6, 1848." By Gouverneur Emerson, M D Henry C Clark, Printer, Philadelphia, 1849

"An Address delivered before the Delaware Horticultural Society at Wilmington, on the 24th of September, 1851" By Gouverneur Emerson, M D

"Report on the Agency of the Refrigeration Produced by Upward Radiation of Heat as an Exciting Cause of Disease" "Transactions of the American Medical Association," Vol vi, 1853, pp 139-152.

"An Address delivered before the Agricultural Society of Chester County, Pa, September 17, 1853," By Gouverneur Emerson, M D.

"An Address delivered before the Agricultural Society of New Castle County, Del, at the Annual Exhibition held in Wilmington, September 12, 1855" By G Emerson, M D

"An Address delivered before the Agricultural Society of Kent County, Del., October 15, 1857" By G Emerson, M D, of Philadelphia.

"Results of Extensive Experiments in the Use of Superphosphate of Lime, etc, communicated to the Agricultural Society of Kent County, Del" By Dr. G. Emerson, February 2, 1859

"Jourdan's Ammoniated Superphosphate of Lime, its Nature and Uses,

with directions to farmers for applying it to their crops, and observations which cannot fail to impart much useful practical information "

[There is conclusive evidence that this pamphlet was written by Dr Emerson]

"Cotton in the Middle States, with Directions for its Easy Culture." By G Emerson, M D Author of the "Farmer's and Planter's Encyclopedia," Philadelphia, 1862.

"Land Drainage." An address delivered before the Farmer's Club of Kent County, Del , at Dover, January, 1872 By G Emerson, M D , of Philadelphia. [Illustrated by a topographical sketch map of Kent county, Del]

"The Organization of Labor, in accordance with Custom and the Law of the Decalogue, with a summary of comparative observations upon good and evil in the regime of labor, the causes of evil existing in the present time, and the means required to effect reform , with objections and answers, difficulties and solutions." By F Le Play, Senator (of France), Inspector-General of Mines, Commissioner-General to the Universal Exposition (in Paris), of 1855, 1862 and 1867 Author of *Des Ouvriers Europeens* and *La Reforme Sociale*

"Les politiques veulent en un état bien réglé, plus des maitres des arts mechaniques, que de maitres des arts libéraux " Richelieu (*Testament Politique*)

Translated by Gouverneur Emerson, M D , member of the American Philosophical Society From the French of the second revised and corrected edition published at Tours, in 1870 Claxton, Remsen & Haffelfinger, Philadelphia, 1872. 12mo, pp 417.

Stated Meeting, January 2, 1891.

Present, 17 members.

Mr DUDLEY in the Chair

Correspondence was submitted and accessions to the Library were announced.

A letter was received from Mr L Vossion, dated Philadelphia, December 20, 1890, accepting membership.

A circular was received in regard to the celebration of the seventieth birthday of Prof Rudolph Virchow, from the Committee on the same in Berlin.

The report of the judges and clerks of the annual election was submitted, and the following members were declared the Officers and Council of the Society for the year 1891.

President

Frederick Fraley.

Vice-Presidents.

E. Otis Kendall, Dr. Ruschenberger, J. P. Lesley

Secretaries

George F. Barker, Daniel G. Brinton, Henry Phillips, Jr., George H. Horn

Curators.

Patterson Du Bois, J. Cheston Morris, Richard Meade Bache.

Treasurer

J. Sergeant Price.

Councilors (for three years).

Aubrey H. Smith, George R. Morehouse, Samuel Wagner, William C. Cattell.

Councilor for two years, in place of Dr. Daniel R. Goodwin, deceased

Dr. Charles S. Wurts.

Nominations for Librarian being in order, Mr. William P. Tatham nominated Mr. Henry Phillips, Jr., Prof. E. D. Cope nominated Mr. Benjamin Smith Lyman.

The Secretaries presented a paper by Dr. J. Lindhal on a skull of a Megalonyx leidii, n. sp., for the Transactions. On motion, the communication was referred to a Committee of three members, to be appointed by the President, to examine and report upon.

(The President subsequently appointed Profs. Leidy, Lesley, and Heilprin as such Committee.)

Dr J Cheston Morris called the attention of the Society again to the subject of Vital Molecular Vibrations

Force is not motion, as Dr McLaughlin puts it, but that which causes motion or change in matter While its true nature is unknown, the phenomena of the various physical forces correspond so completely with undulations or vibrations that they are recognized as such, the results of impulses brought to bear upon matter capable of atomic vibration, and the tendency of modern thought is more and more towards considering light, heat, electricity, chemical affinity and mechanic force as all of them essentially only modifications of one and the same force. But when we come to consider the phenomena of life, while we find that living bodies are all composed of material atoms similar to those of the inorganic world, another force or impulse seems to be at work suspending or reversing the ordinary action of the physical forces. It is characterized by acting, as they do, only under special conditions, viz, the presence of plasma or organizable matter, heat, oxygen, light, and a germ, itself the product of previous life Withdraw any of these—the ordinary phenomena of inorganic matter present themselves. But whenever they are present, an organized form results which tends to follow the type of its parent forms. Fresh particles of matter are taken up and others are discharged, in other words, we have the phenomena of growth, development, secretion, excretion and of reproduction, all the physical laws and properties of matter are retained and followed, but they are subordinated to or coördinated with those of another force, which we call vital, organic or germ force, with its own laws as distinctly defined as those of chemistry or heat. It is just as unreasonable to deny the existence of the former as of the latter

Hitherto the vibratory theory has only been applied to explaining physical phenomena. It remained for Dr McLaughlin to extend its application to vital phenomena, by showing how completely it explains the phenomena of immunity from, and prevention of, infectious and contagious diseases by the law of *interference* I wish to call your attention to a similar explanation of the phenomena of germ force and heredity by the law of *transference* If two weights are suspended at proper distances from a cord fastened transversely between two pillars, and a third weight is similarly suspended between them, and motions imparted perpendicularly to each other to the two outer weights, these motions will be so transferred to the third weight as to cause it to describe a series of curves resulting from the impulses transmitted, or if a powder be dusted over a square tin plate, and the edge of the latter be touched at certain nodal points, the powder will arrange itself in certain lines and geometric figures Is not this precisely what happens when the germ cell and sperm cell, the molecules of each vibrating in accordance with the impulses impressed upon it, unite in the production of the new germ, which in turn vibrates in accordance with those impulses, and proceeds accordingly to arrange and develop fresh molecules, forms and figures similar to its

antecedents? In this way we have the explanation of the germ resulting only as the harmonic product of suitable vibrations—of the hereditary transmission of qualities—and of the variations from type which occasionally occur. We have also the explanation of the cessation when life vibrations shall have been exhausted or transmuted into other forms of life itself, or so-called death We have also the explanation of the periodicity of many, if not all, of the functions of living bodies, both in health and disease Likewise, we have an explanation of the effects of drugs on certain organs and functions. To say "that opium produces sleep on account of its somniferous tendency" is to veil our ignorance very thinly But, if we suppose that nerve tissue has a certain vibration, so differing in period from that of the morphia molecule which we introduce into the blood, that until the latter is eliminated or changed the nerve vibrations are modified or suspended we can form a much more rational conception of the effect of opium So also with the selection of appropriate food from a common plasma by different organisms, and also from the blood by the various organs and structures of the body In fact, a new field is opened to biologists, naturalists, physiologists and physicians whose limits are at present far beyond our ken.

New nomination No. 1217 was read.

The Committees appointed at last meeting, of which Dr. Cope and Mr Biddle were respectively Chairmen, were continued.

And the Society was adjourned by the presiding member

Stated Meeting, January 16, 1891

Present, 73 members

President, Mr FRALEY, in the Chair

Correspondence was submitted and accessions to the Library were reported

Mr. L. Vossion and Prof G S Fullerton took their seats

A circular was received from the Museo de la Plata, Argentine Republic, requesting exchanges, also sending one of its publications.

Letters of acknowledgment were received from the Geological Survey of India, Calcutta (131, 132, 133), Taschkent

Observatory, Taschkent, Russia (131, 132, 133); K. K. Geologische Reichsanstalt, Drs. Friederich Muller, Dionys Stur, Vienna (131, 132, 133); Naturwissenschaftliche Verein des Reg. Bez., Frankfurt a O. (131, 132, 133); Mr Joseph Prestwich, Shoreham, Kent, England (127, 128, 129, 130); Chicago Academy of Science, Chicago (130, 131, 132, 133)

Accessions to the Library were received from the Académie R. de Belgique, Bruxelles, Naturwissenschaftliche Verein des Reg.-Bez, Frankfurt a. O , Verein für Erdkunde, Halle a. S.; Physikalische-Medicinische Societat, München, Prof. Ferdinando Borari, Naples, R. Accademia dei Lincei, Rome, Osservatorio Astronomico, Turin; Société de Géographie, Lille, Commission des Annales des Mines, Rédaction "Cosmos," Paris, R. Astronomical Society, Editors of the "Geological Magazine," "Nature," London, Prof George M Dawson, Ottawa, Canada, Museum of Comparative Zoology, Harvard University, Cambridge, Mass., American Statistical Association, Boston, Editors of "American Journal of Science," Yale College, New Haven, University of State of New York, Albany, New York Historical Society, New York, Franklin Institute, Engineers' Club, College of Pharmacy, Editors of the "Homœopathic Physician," "Medical and Surgical Reporter," "Medical News," American Bar Association, Mercantile Library, Messrs. J. E Ives, Henry Phillips, Jr., Philadelphia, U S Naval Institute, Annapolis, Johns Hopkins University, Editors of "American Journal of Philology," "American Chemical Journal," Baltimore; Department of State, U S Naval Observatory, Smithsonian Institution, Anthropological Society, Hydrographic Office of U. S. Navy, Prof Albert S Gatschet, Washington, D C., Public Library of Cincinnati, Musée de la Plata

The stated business of the meeting was then taken up, and, on motion, the Society resolved to proceed to the election of Librarian for the ensuing year. It was resolved to conduct the same by ballot, and that the polls should remain open thirty minutes, during which the Society took a recess to enable the members present to deposit their votes.

J. Sergeant Price, Esq., and Dr. Persifor Frazer were appointed by the Chair as tellers to conduct the said election, who, after the polls had been closed, reported to the President that Mr. Henry Phillips, Jr., had received 39 votes, and Mr Benjamin Smith Lyman, 31 votes; whereupon the President declared Mr. Henry Phillips, Jr., to have been duly elected Librarian of the Society for the ensuing year.

[Secretary Phillips being present and not voting]

On motion, the President was authorized to appoint at his leisure the Standing Committees of the Society, which he subsequently selected, as follows.

Finance

William B. Rogers, Philip C. Garrett, Charles S. Wurts

Hall.

J Sergeant Price, William A. Ingham, Charles A Oliver.

Publication.

Daniel G. Brinton, George H. Horn, Samuel Wagner,
Patterson DuBois, Horace Jayne

Library

Edwin J Houston, William V. McKean, William John Potts,
Jesse Y Burk, William H Greene.

The Committee on the Paper of Dr J Lindahl reported the same to be worthy of publication, which was so ordered, and the Committee was discharged

Prof. Cope's Committee and Mr. Arthur Biddle's Committee reported progress and were continued.

Pending nomination, No 1217, and new nominations, Nos. 1218 and 1219, were read

And the Society was adjourned by the President

Stated Meeting, February 6, 1891.

Present, 17 members.

President, Mr FRALEY, in the Chair.

Correspondence was submitted and accessions to the Library were announced.

The President announced the death of Hon. George Bancroft (January 17, 1891), æt 91, and, on motion, was authorized to appoint a suitable person to prepare the usual obituary notice Prof J. Bach McMaster was subsequently appointed.

Pending nominations 1217, 1218 and 1219 were read.

Mr Arthur Biddle presented a report from the Committee on the Etting Bequest, recommending that the Society decline to take any part in the litigation arising out of the caveat filed to the last two codicils of the will of F. M Etting, deceased, now pending, and that the Society decline to act as Trustee under said will

On motion of Mr. Horner, the report was accepted.

On motion of Dr. Morris, the Society declined to litigate under the caveat to the last two codicils now pending

On motion of Mr. Horner, the Society declined to accept the trust.

On motion of Mr. Biddle, the Secretaries were requested to notify the executors of the action of the Society

And the Society was adjourned by the President.

Stated Meeting, February 20, 1891

Present, 12 members

Mr. WILLIAM A INGHAM in the Chair.

The death of Prof. Alexander Winchell, Ann Arbor, Mich., February 18, 1891, æt. 72, was reported.

Correspondence was submitted and accessions to the Library were reported

The Free Public Library, Jersey City, was placed on exchange list to receive Proceedings.

The Library Committee reported suggestions to facilitate the replacing of the books on the shelves in the Society's Library; that the Library room should be finished; that bookcases to contain works of reference should be placed in the meeting room, and that the Society should appropriate $500 for the purchase of new books.

After this latter recommendation had been presented, a letter was read from the Treasurer requesting that no appropriation should be made for that purpose for the present, giving his reasons for the same.

The Committee's recommendation was postponed for the present

The minutes of the Board of Officers and Council were submitted.

Pending nominations Nos. 1217, 1218 and 1219 were read, spoken to, and balloted for, and No. 2187, Commander F M. Green, U. S School Ship *Saratoga*, was declared elected a member of the Society.

And the Society was adjourned by the presiding member.

Stated Meeting, March 6, 1891.

Present, 19 members.

President, Mr. FRALEY, in the Chair

Correspondence was presented and donations to the Library reported:

A letter from Theodore Turrettini (Geneva, February 8, 1891) accepting membership.

A circular in relation to the formation of State library associations.

A circular in relation to the Fifth International Geographical Congress to be held in Washington, August 26, 1891.

A circular from the Society of Borda, Dax, announcing the death of M Henry du Boucher, a former President.

A circular from l'Académie des Sciences, etc., de Belgique, announcing the death of Lieut.-General J B. I. Liagre, its Permanent Secretary

A letter from R. Brabbée (Vienna VIII, Kochgasse 27) enclosing a specimen of his new method of reckoning.

A letter from Dr Antonio Del Bon (Padua) in relation to Prof. P. E. Chase's paper on "English and Sanskrit Root-analogues."

Letters from August Tischner (Leipzig) on "The Celestial Phenomena," "The Movements of the Sun in Space," "The Movements of the Planets," "The Solar System" and "The Elements of the Elliptic Orbits."

A paper by Dr. D. G Brinton entitled "Some Vocabularies from the Musquito Coast" was presented.

Dr. J. Cheston Morris presented a pamphlet entitled "Tepeu" (by Dr Thomas E. Pickett), on the hypothetical migrations of the *Morbus Americanus*, upon which he made some remarks, referring to the account given by Josephus of the evils caused the Jewish youth by the entrance of the Midianitish women into the Hebrew camp

Dr. J. Cheston Morris made some remarks on "Hebrew Phonetics," and was followed by Prof. J P. Lesley upon the same subject.

Prof. Lesley made some remarks on a report by Mr. John Fulton (Johnstown, Pa) on the diminution of the supply of natural gas and its ratio.

Dr Morris called attention to the case of the miners recently entombed at Jeanesville, Pa., for nineteen days almost without food. "They were found in a breast near where they had been working. The water from an abandoned mine at a much higher level, estimated at 145 feet, had entered the mine and

imprisoned them. This is the longest period in the history of mining in Pennsylvania of preservation of life under such circumstances. And in this connection it may be also well consider that in no case on record has an attempt at cannibalism been made by the sufferers. This fact should be placed to the credit of a class of men too often unjustly despised and maligned. When these men were borne alive from the mine, the whole crowd of bystanders accompanied them to the temporary hospital singing the doxology

"The level of the water in abandoned mine dropped slowly, day by day, in consequence of pumping incessantly, at rates varying from two to fourteen feet."

New nominations Nos. 1220, 1221 and 1222 were read.

The Committee on Improved Accommodations reported progress.

Prof. Cope, from the Committee appointed December 19, 1890, to consider the improvement of the Proceedings of the Society, presented a report.

Considerable discussion took place upon the same, and the following resolution was adopted, *nem. con*

Resolved, That the Report and Resolutions accompanying be recommitted to the same Committee, and the Committee be continued in order to obtain fuller data as to the matters therein referred to, and the Committee be instructed to present its Report at the first meeting of the Society in May, 1891 (May 1)

On motion, the Society

Resolved, That the Treasurer, J Sergeant Price, Esq, be authorized and directed to give notice to the City of Philadelphia to quit the rooms in the building of the Society now occupied by it for the use of the courts and its officers, at the end of the present tenancy, viz, on the 1st of July, 1891

And the Society was adjourned by the President.

Stated Meeting, March 20, 1891.

Present, 8 members.

Dr J. Cheston Morris in the Chair.

Correspondence was submitted as follows

Letters of envoy were received from the Ministère des Travaux Publics, Paris, Meteorological Office, London

Letters of acknowledgment were received from Royal Society of Victoria, Melbourne, Australia (131, 132, 133); Mr. Samuel Davenport, Adelaide, Australia (130), Royal Society of N S. Wales, Sydney, Australia (131, 132, 133), Tokyo Anthropological Society (131, 132, 133), Société R. des Sciences, Upsal, Sweden (130, 131, 132, 133, and Trans. xvi, 3); Friesch Genootschap, Leuwarden (133), R. Accademia degli Agiati, Rovereto, Austria (129, 130, 132, 133), Prof Hermann Rollett, Vienna (129, 130, 132, 133), Prof Hauer, Vienna, Austria (132, 133), Naturwissenschaftliche Wochenschrift, Berlin (131, 132, 133), K Bibliothek, Berlin (131, 132, 133); Naturforschende Gesellschaft, Emden (131, 132, 133), Prof. E. Haeckel, Jena (131, 132, 133), Dr Julius Platzmann, Leipzig (131), Verein für Vaterländische Naturkunde, Stuttgart (131, 132, 133); Am Geog. Society, New York (131); Mr L. Vossion, Philadelphia (131, 132, 133, 134); Denison Scientific Association, Granville, O (131, 132, 133); Michigan State Library, Lansing (131, 132, 133, 134); Museo National de Buenos Aires (125, 126, 127, 128, 129, 131, 132, 133).

Letters of acknowledgment (134) were received from Mr. J. M. Le Moine, Quebec, Toronto University Library, Canadian Institute, Sir Daniel Wilson, Toronto, Geological Survey, Ottawa, Maine Historical Society, Society of Natural History, Portland, Me ; New Hampshire Historical Society, Concord, Dr. C. N. Hitchcock, Hanover, N H , Amherst College, Boston Society of Natural History, Mass Historical Society, Athenæum, Messrs. T. M. Drown, Robert C Winthrop, S. P.

Sharples, Boston, Museum of Comparative Zoology, Profs. A. Agassiz, Robert N Toppan, Cambridge; The Essex Institute, Salem; American Antiquarian Society, Worcester, Free Public Library, New Bedford; Mr James B. Francis, Lowell; Prof. Pliny Earle, Northampton, Mass.; New Haven Colony Historical Society, Connecticut Historical Society, Hartford; Mr. George F. Dunning, Farmington, Conn.; New York State Library, Albany; Hamilton College, Clinton, Profs. T. F Crane, J. M. Hart, B G Wilder, Ithaca, Vassar Brothers' Institute, Poughkeepsie, Rochester Academy of Science; Library of U S. Military Academy, West Point; The Oneida Historical Society, Utica, N. Y., New York Hospital, University of the City of New York, Dr John J Stevenson, Columbia College, Gen. Henry L. Abbot, Meteorological Observatory, American Museum of Natural History, New York; New Jersey Historical Society, Newark, Free Public Library, Jersey City; Prof C. A. Young, Princeton, Mr Isaac C. Martindale, Camden, N J; Dr. Robert H. Alison, Ardmore; Mr Burnet Landreth, Bristol; Dr Martin H Boyè, Coopersburg; Mr. Eckley B Coxe, Drifton, Drs. Traill Green, J. W. Moore, Thomas C Porter, Easton; Mr. Andrew S McCreath, Harrisburg, Haverford College, Drs Allen C Thomas, Isaac Sharpless, Lyman B Hall, Haverford College; Mr. J. N Fulton, Johnstown, Linnean Society, Lancaster, Mr. P. F. Rothermel, Linfield, Messrs. Heber S. Thompson, P. W Sheafer, Pottsville, Mr. M. Fisher Longstreth, Sharon Hill; Lackawanna Institute of History and Science, Scranton; Philosophical Society, Messrs. Washington Townsend, Philip P. Sharples, West Chester, Pa., Library of the Pennsylvania Hospital, Engineers' Club of Philadelphia, Philadelphia Library, Wagner Free Institute of Science, Zoological Garden, Franklin Institute, Academy Natural Science, Messrs. John Ashhurst, Jr., Andrew A. Blair, Charles Bullock, Edwin J. Houston, S. Castner, Jr, Thomas M Cleemann, C. S. Dolley, Samuel Dixon, Patterson Du Bois, Frederick Fraley, Persifor Frazer, George Friebis, George S Fullerton, Horace Howard Furness, H. D. Gregory, F. A Genth,

Fred. A Genth, Jr, Edward Hopper, W. A Ingham, William W Jefferis, W W Keen, J. P Lesley, John Marshall, Geo. R. Morehouse, James T Mitchell, E. Y McCauley, Charles A Oliver, J. Sergeant Price, Robert Patterson, William Pepper, Henry Phillips, Jr., Franklin Platt, C. N Peirce, W S. W. Ruschenberger, Henry Reed, Theo D. Rand, James W. Robins, L. A Scott, Benjamin Sharp, Albert H. Smyth, Aubrey H Smith, H. Clay Trumbull, Samuel Wagner, William H. Wahl, Henry Willis, Mrs. Helen Abbott Michael, Philadelphia; Rev F. A Muhlenberg, Reading, Pa.; U. S. Naval Institute, Annapolis, Peabody Institute, Maryland Institute, Maryland Historical Society, Baltimore, Md., Bureau of Ethnology, U S Geological Survey, Smithsonian Institution, U S Signal Office, U S. Naval Observatory, Surgeon-General's Office, Anthropological Society, Patent Office, Rt. Rev John J Keane, Messrs. Charles A. Schott, H Haupt, Albert S. Gatschet, Garrick Mallery, W. Strong, Washington, D C., Prof J. C White, West Virginia University, Morgantown, W Va ; University of Virginia, University of Virginia P O , Mr Jed. Hotchkiss, Staunton, Va , Elliott Society of Science and Art, Charleston, S C ; Georgia Historical Society, Mr. William Harden, Savannah, Ga , University of Alabama; Denison Scientific Association, Granville; Cincinnati Society Natural History, Cincinnati Observatory; Rev. Henry S. Osborn, Oxford; Dr. E. W. Claypole, Akron, O., Dr. Robert Peter, Lexington, Ky ; Athenæum, Columbia, Tenn , University of Tennessee, Knoxville, Tenn.; University of Illinois, Champaign, Ill , The Newberry Library, Chicago, Ill , Dr. John L. Campbell, Crawfordsville, Ind , State Historical Society of Wisconsin, Madison; Prof. J C. Branner, Little Rock, Ark , Col William Ludlow. Gen W. F. Raynolds, Detroit; Prof Alexander Winchell, Ann Arbor, Mich ; Colorado Scientific Society, Denver; Kansas State Historical Society, The Kansas Academy of Science, Topeka; Observatorio Astronómico National Mexicano, Tacubaya, Mexico

Accessions to the Library were reported.

Pending nominations 1220, 1221, 1222, and new nominations 1223, 1224, 1225 and 1226 were read.

And the Society was adjourned by the presiding member

Stated Meeting, April 3, 1891.

Present, 18 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted.

Accessions to the Library were reported

Prof. Lesley read an obituary notice of the late Peter W. Sheafer (b March 31, 1819; died at Pottsville, March 26, 1891).

The death of Dr Thomas B Reed was announced (Philadelphia, April 1, 1891, æt. 59).

Prof. Lesley read a paper "On An Important Boring Through 2000 Feet of Trias in Eastern Pennsylvania," which was followed by some remarks on the subject by Mr. B S Lyman.

Pending nominations, Nos. 1220, 1221, 1222, 1223, 1224, 1225 and 1226 were read.

The report of the Trustees of the Building Fund was presented.

And the Society was adjourned by the President.

Stated Meeting, April 17, 1891.

Present, 18 members.

President, Mr FRALEY, in the Chair

Correspondence was submitted as follows:

A letter was received from the American Consul General, Melbourne, Australia, asking the Society to participate in a

scientific expedition to the Solomon Islands and other places, with a view of collecting ethnological and anthropological specimens.

A circular was received from the Royal Society of New South Wales, offering its medal and money prize, for the best communication containing the results of original research or observation upon scientific subjects.

An invitation was received from the Hungarian Committee to attend the Second International Ornithological Congress, which will be held in Budapest at Whitsuntide, 1891.

Letters were received from the Société Hongroise de Géographie, and from the "Journal of Comparative Neurology," Cincinnati, Ohio, asking for exchanges, which were so ordered.

Letters of envoy were received from the Royal Society of New South Wales, Sydney, Musée Teyler, Haarlem; Nederlandsche Letterkunde, Leiden, Ministère de l'Instruction Publique, Paris; Bath and West and Southern Counties Societies, Bath, England, Royal Statistical Society, London; Mr. Frank Vincent, New York, Department of the Interior, Smithsonian Institution, Washington, D C

Letters of acknowledgment were received from the Tokyo Library (131, 132, 133), Université Royale, Lund, Sweden (130, 131, 132, 133), Physikalisch-Medizinische Societat, Erlangen (131, 132, 133), K Sachs. Alterthumsverein, Dresden (131, 132, 133); Oberhess. Gesellschaft fur Natur- und Heilkunde, Giessen (131, 132, 133), Prof Otto Bottlingk, Leipzig (131, 132, 133), K. K Sternwarte in Prag (130), Museum d'Histoire Naturelle, Strasburg (131, 132, 133), Naturforschende Gesellschaft, Schweiz Naturforsch. Gesellschaft, Bern (131, 132, 133), Biblioteca Nazionale Centrale, Firenze (131, 132, 133), R. Comitató Geologico D'Italia, Rome (131, 132, 133).

Mr. R. Meade Bache read a paper on "Possible Sterilization of City Water," which was followed by a discussion.

Pending nominations 1220, 1221, 1222, 1223, 1224, 1225 and 1226, and new nominations Nos. 1227, 1228 and 1229 were read.

And the Society was adjourned by the President.

Stated Meeting, May 1, 1891

Present, 18 members.

President, Mr FRALEY, in the Chair.

Letters of envoy were received from the K Akademie der Wissenschaften, Vienna, Austria, Société des Sciences Naturelles et Archéologiques de la Creuse, Guéret, France.

Letters of acknowledgment were received from the Naturhistorische Gesellschaft, Hanover, Prussia (131, 132, 133), R. Accademia dei Lincei, Prof G Sergi, Rome (131, 132, 133), Marquis Antoine de Gregorio, Palermo, Sicily (131, 132, 133), Société Nationale des Sciences Naturelles et Mathematiques, Cherbourg, France (131, 132, 133), Société des Sciences Naturelles et Archéologiques de la Creuse, Guéret, France (131, 132, 133), Prof. Léon de Rosny, Paris (131), Société Académique, Troyes (131, 132, 133); Société Polymathique de Morbihan, Vannes (131, 132, 133), Sir J W. Dawson, Montreal (134); State Library of Massachusetts, Boston (134); Prof. Elihu Thomson, Swampscott, Mass. (134)

At request of the Kg. Norske Videnskabers Selskab, Throndhjem, Norway, it was placed on list to receive Proceedings from 131.

The following societies were placed on the exchange list to receive Proceedings from No 131:

K Sachs. Meteorologische Institut, Leipzig, K. Sachs. Sternwarte, Leipzig; Académie des Sciences, etc., Angers, France; Schlesische Gesellschaft fur Vaterlandische Kultur, Breslau, Germany, Società Italiana delle Scienze (5 Piazza S. Pietro in Vincoli), Rome, Italy; Naturwiss. Verein, Regensburg, Germany, Bureau fur Wetter Prognose, Leipzig, Saxony; Naturhist. Landes-Museum, Klagenfurt, Austria; Société Géologique de Normandie, Havre, France

An engraved portrait of the late Prof Von Rath was presented by his widow.

The following deaths of members were announced ·

Rev. S. S. Lewis (Cambridge, England), March 31, 1891.

Dr John LeConte (Berkeley, Cal), April 29, 1891, æt. 73 (b. Dec. 4, 1818).

Dr. Joseph Leidy (Philadelphia), April 30, 1891 (b. Sept. 9, 1823).

On motion, the President was authorized to appoint suitable persons to prepare the usual obituary notices of Dr. Leidy and Dr. LeConte.

Prof. Lesley read a paper on "Artesian Wells in Philadelphia, Norristown, Montgomery and Delaware Counties," with notes by Prof. Oscar C. S. Carter.

Prof. Lesley presented a paper by Prof. Oscar C. S. Carter on "The Feldspar Bed in the Laurentian Gneiss near Lafayette Station"

Mr. Holman made an oral communication in relation to a new microscope, lately invented by him, by which objects distant from its front lens over two and a half feet could be readily examined in their habitat. For example, at that distance a salamander of a few inches in size would appear some thirty inches in length, and its whole circulation of blood would be plainly visible. The instrument uses a photographic lens as an object glass, and is really a short-focus telescope.

Pending nominations Nos. 1220 to 1229 (inclusive) were read

Mr. J. Sergeant Price, the Treasurer, having reported to the Society that he had received through its attorney, Mr. John H. Harjes, of Paris, the sum of three thousand eight hundred and fifty five dollars and forty two cents, the full amount of the legacy of twenty thousand francs (at the exchange of 5 18¾ francs per docia) given to it by the will of the late Mr. Auguste Carlier, of Paris, a member of our Society, submitted the following resolutions, which were unanimously adopted:

Resolved, That the thanks of the Society be returned to Mr Louis Vossion, the French Consul at Philadelphia, for his aid in preparing the necessary papers and certificates therein for presenting our claim for said legacy to Mr. P Massion, of Paris, the Executor of Mr Auguste Carlier, he as a member of our Society declining to make any charge therefor for fees and expenses.

Resolved, That the thanks of the Society be returned to Mr. John H. Harjes, of the firm of Messrs. Drexel & Co., for his valuable services as our representative in Paris, in obtaining from Mr P Mussion, the Executor of Mr. Auguste Carlier, the legacy of twenty thousand francs given to us by his will and remitting the same to us without any charge for the time and care given to our interests, which acts of kindness are highly appreciated by the Society

The Committee on Extended Accommodations reported progress.

The deferred business being in order, the report of the Committee submitted March 6, 1891, was taken up

Prof. Cope moved that the consideration of the same be postponed until the next regular meeting of the Society, and that notice thereof should be placed upon the meeting postal-cards.

Mr. Price moved, as a substitute and amendment, that the consideration of the report should be postponed until the first regular meeting in November, 1891.

The amendment, being put to a vote, was declared carried.

The resolution as amended was then unanimously adopted.

And the Society was adjourned by the President.

Stated Meeting, May 15, 1891.

Present, 19 members.

President, Mr FRALEY, in the Chair

Correspondence was submitted as follows. A circular was received from the Observatorio de San Fernando announcing the death of the Director of the Observatory, Sr. D Cecilio Pujazon.

Letters of envoy were received from the K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Royal Statistical Society, London.

Letters of acknowledgment were received from the Linnean Society of New South Wales, Sydney (180); Rhode Island Historical Society, Providence (184), Prof O. N. Rood, New York Academy of Sciences (184); Dr. Morris Longstreth, Messrs. John R. Baker, J S Harris, George de B. Keim, George Stuart, College of Pharmacy, Philadelphia (184); State Library of Pennsylvania, Harrisburg (184), Mr John F. Carll, Pleasantville (134), Prof. J. T. Rothrock, West Chester (134), Wyoming Historical and Geological Society, Wilkesbarre (134), Signal Office, Washington (131, 132, 133, and Transactions xvi, 1, 2, 3), Leander McCormick Observatory, University of Virginia (134); Denison Scientific Association, Granville, O (184), Davenport Academy of Sciences, Davenport, Iowa (184), Observatorio Nacional de Tacubaya, Sociedad Cientifica "Antonio Alzate," Mexico (134), Museo Michoacano, Morelia; Bishop Crescencio Carrillo, Merida, Yucatan (184)

Dr Ruschenberger read an obituary notice of the late Dr. Gouverneur Emerson

The death of Julius E. Hilgard (Washington, D C), May 2, 1891, was announced

The President reported that he had appointed Dr. Ruschenberger to prepare the obituary notice of the late Dr Leidy, and Prof Barker that of the late Dr. LeConte (Berkeley, Cal)

Mr R. Meade Bache read a paper entitled "A Fragment of Objectionable University-Extension Teaching"

The minutes of the Board of Officers and Council were submitted.

Pending nominations Nos. 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228 and 1229 were read, spoken to and balloted for.

At the call of Committees, Prof E J Houston, Chairman, reported a minute of resolutions adopted at the last meeting of the Committee on Library, but the hour of 10 P M. having arrived, after which, by the laws of the Society (Chapter ix, § 5), it is not permitted to take up new business, the considera-

tion of the Report and the matters therein contained, was postponed, on motion, to an adjourned meeting of the Society to be held at its Hall on May 29, 1891, at 8 P M

Secretaries Barker and Brinton, the tellers appointed to conduct the balloting for members, reported the following to have been duly elected members:

2188 Dr René Gregory, Leipzig

2189 Prof Henry W. Spangler, University of Pennsylvania, Philadelphia

2190. Prof A de Quatrefages, Membre de l'Institut, Paris, France.

2191 Sir Robert S Ball, Astronomer Royal for Ireland, Dublin

2192 Prof Charles E Munroe, Newport, R I

2193 Right Rev. William Stubbs, LL D, D D, Bishop of Oxford, England

2194 Dr E T. Hamy, Conservator du Musée du Louvre, Paris, France

2195 Prof Jules Oppert, Membre de l'Institut, Paris, France.

2196 Prof Gaston Maspero, Paris, France

And the Society was adjourned by the President

An Adjourned Meeting was held May 29, 1891

Present, 11 members.

President, Mr FRALEY, in the Chair

The President stated the object of the meeting

Prof. Edwin J Houston, Chairman, read the following ex-

tract from the minutes of the last meeting of the Committee on Library

The Library Committee respectfully reports to the Society that it is unable to understand the plans of the Committee on Extended Accommodations as regards the general character of the new bookcases to be furnished, their location, number and size.

The Library Committee cannot intelligently carry on the work delegated to it by the Society, unless its duties and those of the Committee on Extended Accommodations be clearly defined by the Society

A general discussion took place, and the Chairman of the Committee on Extended Accommodations explained the work and the plans of the Committee.

Prof. Houston stated the points at issue to be three, viz

1 Does the Society desire all its books to be placed in the new Library room? or,

2 Does it wish any in the North room? or,

3 Does it wish any in the Meeting room

On motion of Dr. Morris it was, *nem con*

Resolved, That the stock of publications issued by the Society shall be placed in a portion of the North room.

On motion of Dr Hayes it was, *nem con* .

Resolved, That the Committee on Extended Accommodations be directed to locate and construct cases for books, and cabinets, in accordance with plans to be approved of by the *Library Committee*.

On motion of Prof. Smyth it was, *nem con*

Resolved, That Daniel G Brinton and Henry Phillips, Jr, and each of them, be appointed delegates to represent this Society at the meeting at Moscow, this year, of the Congrès International d'Anthropologie et Archéologie Prehistoriques provided that the said appointment shall entail no expense whatever upon the Society.

And the Society was adjourned by the President.

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXIX. JULY TO DECEMBER, 1891. No. 136.

Notes on Calospasta Lec.

By George H. Horn, M.D.

(Read before the American Philosophical Society, October 2, 1891.)

Some years ago in a critical review of the genera of Meloidæ, it seemed evident, from the modifications of the form of the tarsal claws, that some genera remained to be discovered to fill the gaps existing. These forms were indicated at the time and one of them has already been found. Another of the missing links must come in the vicinity of the genus under discussion and is really foreshadowed in the slight claw modifications already observed. That the material may be at hand and ready for use in the event of further discoveries is my excuse for presenting this short paper for the consideration of those interested.

CALOSPASTA Lec.

In the *Trans. Am. Ent. Soc.*, 1878, p. 60, I gave a brief table of the species then known to me. Since then another species has been described (*loc. cit.*, 1883, p. 312).

Two more new species have recently been collected, both from California, which, with the one not included in my previous table, will require some modification of it.

1. Spurs of hind tibiæ slender and not very dissimilar 2
   Spurs of hind tibiæ dissimilar, the inner slender, the outer cylindrical and truncate 6
2. Elytra strongly costate .... 1. **mirabilis.**
   Elytra not costate 3
3. Median line of front deeply impressed; head red .... 2. **histrionica.**
   Median line of front not at all impressed; head and thorax dark blue or green 4
4. Median line of thorax impressed, thorax not longer than wide, color green .... 3. **viridis.**
   Median line of thorax not impressed 5

5 Thorax narrow, longer than wide; elytra ornate.
Head and thorax obviously punctate . ... 4 **elegans.**
Head and thorax quite smooth . . . . 5 **perpulchra.**
Thorax short, nearly twice as wide as long, black, subopaque.
6. **Fulleri.**

6. Body above and beneath entirely black............. ... 7 **moesta.**
Thorax red
Head and thorax sparsely but distinctly punctate, each punctured with a short, black, neat hair .... 8. **Morrisoni.**
Head and thorax absolutely smooth, without hair
9 **nemognathoides.**

C. mirabilis Horn, *Trans. Am. Ent Soc*, 1870 p. 93.

In this species the antennæ are filiform, the joints closely articulated.

The anterior tarsi of the male are simple, the last ventral segment with a shallow semicircular emargination.

Occurs in Southwestern Utah, Mojave Desert and San Diego, Cal., Rock Spring and near Yuma, Ariz

C. histrionica, n sp.

Piceous black, moderately shining, head red, humeri triangularly orange yellow Antennæ black, filiform, joints moderately closely articulated; head oval, smooth, with but few punctures, median line deeply impressed, hind angles rounded, mouth parts piceous; thorax longer than wide, much narrowed at anterior half; disk feebly convex, transversely depressed in front, a feeble median impression posteriorly, surface almost entirely smooth, elytra nearly twice as wide at base as the thorax, a faint slender costa on each side, surface scabrous, the humeri nearly smooth, body beneath piceous black, shining Length .34–.54 inch; 8.5–14 mm

Male —First three joints of the anterior tarsi thickened, gibbous on the upper side, with a deep groove producing a bilobed appearance Last ventral with a small triangular notch

Female —Anterior tarsi simple Last ventral entire.

The form of the anterior tarsi of the male is a repetition in a less marked manner of that observed in Eupompha, while the form of the head, especially in reference to the median groove of the front, is seen in both Eupompha and Tegrodera.

It seems probable that species will yet occur requiring the union of the three genera, as all of them are characterized by the claws being unequally cleft, the lower portion shorter than the upper and connate with it

Collected near San Diego, Cal. For specimens I am indebted to the kindness of Dr C V. Riley

C. viridis Horn, *Trans Am. Ent. Soc.*, 1868, p 818.

Antennæ rather stoutly filiform, the joints closely articulated, 4–10 not longer than wide.

The thorax is wider than long, the median line impressed.

The male has simple anterior tarsi. The last ventral is broadly triangularly emarginate and impressed along the middle.

This species is notable in having the claws cleft very near the tip, so that the under portion is but little shorter than the upper.

Occurs in Colorado and New Mexico. Collected by Prof. F. H. Snow.

C. elegans, *Lec. Ann. Lyc.*, v, p. 161, *Proc. Acad.*, 1858, p. 341, var. *humeralis* Horn, *Trans. Am. Ent. Soc.*, 1870, p. 98.

Antennæ filiform, moderately closely articulated, joints all longer than wide. On each side of the front, at the insertion of the antennæ, is a gibbosity causing a deep depression above the clypeus.

When fully colored, the dull blue elytra have a yellow vitta of irregular form starting from the humeri, continuing closer to the side than the suture and with an interruption near the apex. The vitta may be reduced in size until there remains merely a triangular humeral spot.

The males have the anterior tarsi dilated, not very notably except the first joint; there is, however, no depression above. The last ventral segment is feebly triangularly emarginate.

Occurs in various parts of Southern California, from San Diego northward.

C. perpulchra Horn, *Trans. Am. Ent. Soc.*, 1870, p. 99.

Very like *elegans* in all its structural characters. The bright blue elytra have three yellow bands, basal, median, and apical, interrupted by the suture. This species may vary by the gradual loss of the bands, from the apical to the basal, until the elytra are entirely blue. Those with the humeral spot only resemble the var. *humeralis*, of the preceding species, but apart from the ornamentation, the two species may be distinguished by the present having a brighter blue color, smoother surface, the head and thorax quite smooth, while in *elegans* they are very obviously punctate.

The sexual characters are as in *elegans*.

Occurs in Owen's Valley, Cal.

C. Fulleri Horn, *Trans. Am. Ent. Soc.*, 1878, p. 59.

Black, subopaque. Antennæ filiform, but rather stout, joints closely articulated and scarcely longer than wide. Head, from in front, triangular in form, the sides parallel behind the eyes, hind angles obtuse, occiput truncate. Thorax nearly twice as wide as long.

The anterior tarsi of the male are simple; the last ventral broadly triangularly emarginate, the fifth broadly and not deeply emarginate.

Occurs in Southern California. Found rather abundantly by Mr. Morrison.

C. modesta Horn, *Trans. Am. Ent. Soc.*, 1878, p. 59.

Entirely black. Thorax longer than wide, not closely punctate. Antennæ slightly thicker externally, the joints submoniliform and not

closely articulated Tarsal claws cleft very near the base, the lower portion not half the length of the upper Spurs of hind tibiæ dissimilar, the outer cylindrical, the apex truncate and slightly expanded, inner spur slender

The males have the anterior tarsi simple, the last ventral with a shallow triangular emargination

From Southern California, precise locality not known.

C. Morrisoni, n. sp

Elongate, black, thorax orange red Antennæ black, slightly thickened externally, joints moniliform, head transversely quadrate, usually with a central rufous spot, parallel for a short distance behind the eyes, hind angles rounded, surface sparsely punctate, thorax scarcely longer than wide, widest one third from apex, apical third more rapidly narrowed, posterior two thirds slightly narrowed, disk feebly convex, a slight median depression posteriorly, surface sparsely but distinctly punctate and with shortened black hairs, elytra scabrous, with very short hairs, body beneath black, shining, sparsely pubescent; posterior tibial spurs dissimilar, the outer cylindrical, truncate, slightly broadened at tip, the inner slender and acute; claws deeply cleft, the lower portion more than half the length of the upper. Length .42-.64 inch, 10.5-16 mm.

Male.—The anterior tarsi are simple. Last ventral broadly triangularly emarginate and slightly longitudinally impressed

In color this species resembles the following, but the head and thorax are very distinctly punctate and more or less pubescent. It is, moreover, much larger, and the surface scarcely shining

Occurs in Southern California, and was found rather abundantly by Mr Morrison. At the time when I had but a unique of the next species I supposed these to be merely fully-developed specimens of it.

C nemognathoides Horn, *Trans Am. Ent. Soc.*, 1870, p. 93.

Black, moderately shining, thorax red Antennæ comparatively slender, the joints longer than wide, not moniliform, head quite smooth, with few very indistinct fine punctures; thorax as wide as long, sides arcuately rounded in apical half, disk convex, without impression, surface smooth and shining, elytra scabrous, sometimes feebly so, surface moderately shining, body beneath black, shining, spurs of hind tibiæ dissimilar, the inner slender, acute, the outer cylindrical, truncate, and slightly wider at tip, claws not deeply cleft, the lower portion two thirds the length of the upper Length .22-.32 inch, 5.5-8 mm.

In the male the anterior tarsi are slender The last ventral segment is deeply incised.

This species might be supposed to be merely a feebly developed form of the preceding. The differences have there been given, to which might here be added the form of the antennæ. It also resembles several of our species of Nemognatha.

Occurs in Owen's Valley, Cal., and in Arizona near Fort Yuma.

The Electrolysis of Metallic Formates

By Hill Sloane Warwick.

(Read before the American Philosophical Society, November 6, 1891.)

The facility with which many metallic formates could be reduced to the metallic state by heat, or in the case of silver and mercury, even by the action of light, having led to the hope that they might be employed with particular advantage in electrolysis, the following series of experiments were made upon solutions of copper, zinc and cadmium formates, in order to ascertain the effect of dilution, temperature and pole separation, as well as the conditions necessary in order to effect their quantitative estimation and separation. The current was generated by a battery of ten cells, of the "crowfoot" type, each cell being 3.1 dm. in height, by 1.9 dm. in diameter, and having a capacity of 3 liters; the dimensions of the zincs were 1.5 cm. by 1.5 cm., and of the radiating copper plates constituting the positive pole 1.5 cm. by 1.5 cm. By means of this battery a comparatively uniform current of 2.8 c.c. electrolytic gas per minute was generated after the cells had been in use for some time.

The strength of the current was measured by means of an ordinary voltameter, and was ascertained before and after the completion of the experiment. For the deposition of small quantities of metal, thick platinum-foil electrodes were used, 3.8 cm. wide, and immersed to the depth of 3.8 cm. in the solution. For quantities above 0.5 gram, they were unsatisfactory, the metal showing a great tendency to separate in a spongy condition at the edge. In the earlier determinations a platinum dish was used, weighing about 67 grams, and having a capacity of 150 c.c.; in the later ones a dish weighing 117 grams, and with a capacity of 275 c.c., was employed. The results obtained with the larger dish were necessarily somewhat less exact than with the one of smaller size. The positive pole consisted of a thick platinum wire, the lower portion of which was wound into a horizontal spiral. In some of the separations it was found expedient to substitute for the spiral a small platinum crucible 2.5 cm. in height and 2.8 cm. in diameter, closed by a cork, through which passed a copper wire in contact with the bottom of the crucible. In order to regulate the distance between the poles, a filter stand was used, having inserted on its movable arm an ordinary binding screw, to which the positive pole was attached.

The following formates were prepared:

Copper Formate.

This salt was made by precipitating cupric oxide from a hot solution of copper sulphate, by means of caustic potash; the precipitate was washed by decantation until free from traces of potash; it was then dissolved in formic acid having the sp. gr. 1.016, obtained in the usual way from oxalic

acid and glycerine, through which a current of steam was allowed to pass in order to prevent too great a rise of temperature, with the consequent production of decomposition products, the salt was allowed to crystallize out by spontaneous evaporation in a current of warm air, and recrystallized. An abundant crop of large, blue, monoclinic crystals was obtained, having the composition $Cu (C HO_2)^2 + 4 H_2O$, efflorescing in dry air, soluble in eight parts of water and changed by boiling to the sparingly soluble basic salt $Cu (C HO_2)^2 \cdot 2 Cu (HO)^2$.

Zinc Formate.

A solution of ordinary crystallized zinc sulphate was treated with an excess of sodium carbonate, heated almost to boiling, freed by decantation from soluble impurity and dissolved in hot formic acid. The solution was evaporated down and allowed to stand, after filtering off a slight precipitate that formed on boiling, and which gave the iron reaction with potassium sulphocyanate.

Monoclinic prisms having the formula $Zn (C HO_2)^2 + 2 H_2O$ separated out, isomorphous with the cadmium salt, permanent in the air and soluble in twenty four parts of water at ordinary temperature.

Cadmium Formate.

This salt was prepared by dissolving cadmium obtained by distillation in vacuo, in nitric acid, neutralizing with a hot solution of potassium carbonate, washing by decantation until free from soluble carbonate and dissolving in formic acid. Large monoclinic crystals separated out, having the composition $Cd (C HO_2)^2 + 2 H_2O$, permanent in the air, readily soluble in water.

(Note.—The formulas of copper and cadmium formates are given as follows $Cu (C HO_2)^2$ and $Cd (C HO_2)^2$ in the last edition of Watts' *Dictionary of Chemistry*, differing from all other authorities. Experiments made to settle the question resulted in the formulas assigned, which is in accordance with the ones usually given.)

Lead Formate.

Solutions of lead acetate and sodium formate were mixed and allowed to stand. Large white anhydrous rhombic crystals gradually separated out in radiating needles, sparingly soluble in cold water, more readily in hot, but with partial decomposition into free acid, and a basic salt of variable composition.

Cobaltous Formate.

A hot solution of cobaltous sulphate was neutralized with caustic soda solution, washed by decantation until free from all but traces of the precipitant, dissolved in formic acid, filtered, and allowed to evaporate in a current of warm air. The salt separated in crusts, consisting of indistinct crystals, having the composition $Co (C HO_2)^2 + 2 H_2O$, dissolving with difficulty to a reddish-colored solution.

Manganous Formate

This salt was prepared from manganous carbonate precipitated from a hot solution of manganous sulphate, by means of sodium carbonate added to alkaline reaction and decanted as rapidly as possible until free from all except very slight traces of soluble salts. It was then dissolved in formic acid and allowed to crystallize very slowly The crystals thus obtained were allowed to recrystallize The crystals are small, pale reddish monoclinic prisms, soluble in fifteen parts of water, and contain two molecules of water of crystallization

Nickel Formate.

A solution of nickel chloride was treated with a slight excess of sodic hydrate, washed several times by decantation with hot water, dissolved in acid and evaporated down A greenish crust formed, made up of very small, bright, green needles—$Ni(CHO_2)^2 + 2H_2O$

Ferric Formate.

Ferric chloride was treated with excess of a solution of ammonia, washed with hot water, and allowed to digest in formic acid at a temperature which was not allowed to exceed 70°, until the hydrate of iron had completely dissolved, which required several hours. The deep red solution was allowed to crystallize by spontaneous evaporation Yellowish-red needles, crystallizing in radiating tufts, separated out, which formed a light, loose, coherent powder When dried at a moderate temperature, it was readily soluble in cold water with an acid reaction. Aqueous solutions on warming became turbid from the partial decomposition of the salt into ferric hydrate and free acid. A similar decomposition takes place in solutions at ordinary temperatures after standing for some time. (The foregoing salt was made in preference to ferrous formate on account of its greater solubility)

Mercuric Formate.

Mercuric oxide was dissolved in formic acid, but on warming the solution slightly it decomposed into the very sparingly soluble white mercurous formate, carbon dioxide and formic acid, according to the following equation

$$2Hg(CHO_2)^2 = Hg_2(CHO_2)^2 + CHO_2H + CO_2 \text{ and}$$
$$Hg_2(CHO_2)^2 = 2Hg + CHO_2H + CO_2$$

The precipitate was gray in color from the presence of free mercury The tendency to decompose is such that in solution at ordinary temperatures these changes take place readily in the light and, with more slowness, even in the dark The "ous" salt comes out in minute shining crystals, very insoluble in water, and on continuous warming becomes entirely converted into free mercury The formates of silver, bismuth

and tin were not prepared, as they were not considered available for various reasons.

In order to ascertain the comparative accuracy of the results obtained by means of the ordinary gravimetric methods, as compared with those obtained by means of the current, a series of experiments was made with the metals chosen for particular study. The gravimetric method adopted was the same for all three, namely, estimation as oxide, conducted in the ordinary way

Copper (Determined as CuO)

	Copper formate taken, in grams.	Copper by theory, in grams.	Copper in CuO formed	Difference in percentage from theoretical
(1)	8094	2259	2261	+ 89 per cent.
(2)	7994	2226	2233	+ 27 "
(3)	7008	1984	1989	— 10 "
(4)	7063	.1984	.1979	— 25 "

The first two determinations were high, due perhaps to the efflorescence of the salt All subsequent weighings were done in a covered watch glass, and the results obtained corresponded closely with the theoretical

In the following electrolytic depositions of copper, solutions of copper formate of known strength were used.

Copper (Determined Electrolytically)

	Copper present in solution.	Copper found	Free formic acid.	c c. H_2O	Time in hours.	Differ'e in percentage from theoretical.
(1)	1484 grams.	1489	10 c.c.	125	46	+ .27 %
(2)	1074 "	1075	15 c c.	"	16	+ 09
(3)	0987 "	0988	5 c.c.	"	17	+ 10
(4)	0987 "	0987	10 c c	"	16	00
(5)	.1074 "	1077	10 c.c	"	16	+ 27
(6)	1037 "	1036	10 c.c.	"	17	— 09
(7)	1037 "	1032	15 c c.	"	17	— 47
(8)	1101 "	1104	10 c.c.	"	42	+ 27

In the above experiments a platinum dish was used at the negative pole, and the wire spiral as the anode. A current of 0 8—1 60 c c HO gas per minute was allowed to run over night. The poles were separated 2 5 cm. Before cutting off the current, the level of the liquid in the dish was raised by the addition of water, and the current allowed to act for an additional half hour No further deposit of copper took place on the clean surface of the dish, indicating that the metal was completely precipitated The current was then discontinued, the liquid quickly poured off, and the dish washed with hot water, being finally dried on a warm iron plate at a temperature not exceeding 100° C. The dish was then set

aside for some time until it had acquired the temperature of the room and weighed. The solutions failed to give any indication, except the merest traces, of copper when tested with ferrocyanide of potassium. The time varied from sixteen to forty-six hours without materially affecting the result. No perceptible oxidation took place during drying, although the deposit was somewhat dark. It came out as a compact adherent coating, readily dissolving in nitric acid.

A comparison between the results obtained shows conclusively not only that the deposition of copper from its formate solution can be accomplished, but that it is fully as accurate as the ordinary gravimetric method.

Zinc (Determined as ZnO)

Zinc formate taken, in grams	Zinc by theory, in grams.	Zinc in zinc oxide found	Difference in percentage from theoretical
(1) .5508	.1875	.1870	— .26 %
(2) "	"	.1876	+ .05
(3) "	"	.1869	— .31
(4) "	"	.1872	—.16

The four determinations made by the usual gravimetric method were estimated finally as zinc oxide which, for purposes of comparison, have been converted into metal.

Zinc (Determined Electrolytically)

Zinc present in grams.	Zinc found	Free acid.	c.c. H_2O	Time in hours	Current in HO gas per minute	Difference in percentage from theory
(1) .0625	.0614	none	100	16	1.8 c.c.	.
(2) .0625	....	10 c.c.	100	16	1.8 c.c.	....
(3) .1250	....	15 c.c.	100	14	2.0 c.c.	....
(4) .0518	.0476	5 c.c.	100	17	.8 c.c.	..
(5) .0518	.0516	15 c.c.	100	17	1.7 c.c.	— .24 %
(6) .0518	.0519	15 c.c.	100	16	1.7 c.c.	+.19
(7) .0518	.0518	25 c.c.	100	16	1.7 c.c.	..
(8) .1026	.1021	10 c.c.	100	17	1.7 c.c.	—.48
(9) .1026	.1023	15 c.c.	100	48	1.8 c.c.	— .29
(10) .1006	.1007	10 c.c.	100	16	1.7 c.c.	+ .09
(11) .1006	.1003	10 c.c.	100	16	1.7 c.c.	— .29

The foregoing determinations of zinc formate were performed under a variety of conditions. (1), (2), (3), (4) were made with the dish as cathode, and the wire spiral as the positive pole, the results both with and without free acid were unsatisfactory, the deposit being very spongy and failing to come out completely, as proved by testing the solution with potassium ferrocyanide. The dish was then made the anode and the zinc was allowed to separate on the platinum crucible which was made the negative pole. The amount of free acid varied from 10 to 25 c.c. The deposit was

gray and adherent on the sides and bottom, but rather spongy at the periphery *Around the top of the crucible the metal was black in color.* The final determinations were accurate but required the greatest care to avoid detaching loose particles of metal

The deposit was not regular, the bottom of the crucible being more or less free from zinc on account of the accumulation of gas. The time of deposition averaged sixteen hours. Such currents as sufficed to separate copper were unsatisfactory, even when the electrodes were brought in close contact In the determinations that were satisfactory, the current strength varied from 1 6—1.8 HO gas per minute, and the poles were close together.

Cadmium (Determined as CdO).

Cadmium formate taken	Cadmium by theory	Cadmium in CdO found	Difference in percentage from theory
(1) 4994	.1988	1983	— 23 %
(2) 4984	1988	1982	— 30

Both results are somewhat too low, possibly owing to reduction of the oxide to metal and consequent loss by volatilization

Cadmium (Determined Electrolytically).

Cadmium present in grams.	Cadmium found in grams	Free acid	c c H_2O	Time in hours.	Diff'ce in percent from theoretical
(1) 0497	0498	15 c c.	100	16	+ 20 %
(2) .0994	.0996	10 c.c.	100	18	+ 20
(3) 0994	0991	10 c.c.	100	16	— 30
(4) 1241	1239	10 c c.	100	44	— 40
(5) .1241	1239	10 c c.	100	17	— 16
(6) 0984	0984	10 c c.	100	16	
(7) 0984	.0985	10 c.c	100	16	+ 10
(8) .1004	1005	10 c.c	100	16	+ 09
(9) .1004	.1002	10 c c	100	17	— 19

The dish was used as the negative electrode, the spiral as the positive, except (1), in which the cadmium was deposited on the crucible, the dish serving as the anode The distance between the poles was 2.5 cm. The variations in the conditions of the experiments noted above caused no noticeable difference in the results. The deposit was not apparently oxidized by moderate warming Current 1.25 to 1 5 c.c. HO gas per minute.

The solutions were tested for cadmium at the conclusion of each experiment, but none was found, proving that the metal was completely deposited. It formed a firm and adherent coating, white in color, with a bright metallic lustre.

I. Influence of Dilution upon the Precipitation of Copper.

Copper present in grams.	Copper found	Free acid	c c H_2O	c c HO gas per minute	time in hours
(1) 0717	.0199	8 drops	100	1 75	1
(2) 0358	0111	[illegible] "	"	"	"
(3) 0179	0057	[illegible] "	"	"	"
(4) .0089	.0028	[illegible] "	"	"	"
(5) 0044	0014	[illegible] "	"	"	"
(6) 0023	.0006	[illegible] "	"	"	"
(7) 0011	.0001	[illegible] "	"	"	"

The distance between the poles was 3 5 cm The area of the electrodes was (3 9 cm × 8 17 cm) × 2. The deposition was performed in beakers, having a capacity of 400 c c , a height of 10 cm and 7 6 cm in diameter. The deposit was bright and adherent and, although the amount of free acid present was very small, the metal was not spongy The results obtained were in close accord with those assigned by theory according to the law that the amount of metal deposited in a given time is proportional to the strength of solution

II. The Influence of Temperature upon the Precipitation of Copper

Copper taken in grams.	Copper deposited	Free acid	c c H_2O	Time in hours.	Temperature in degrees Cent.
(1) 0911	.0019	none	150 c c.	1	20°
(2) "	.0046	"	"	"	40°
(3) "	0080	"	"	"	60°
(4) "	0119	"	"	"	80°

The area of the electrodes was (3 5 cm × 3 8 cm) × 2 Distance between poles 2 8 cm The current gave 1.25 c c HO gas per minute (1) was slightly spongy and had a slight deposit of basic green salt at the top (2) was somewhat dark and slightly spongy at the top but adherent The amount of metal deposited increased with rise of temperature, as follows 0027 grams (20°–40°), 0034 grams (40°–60°), 0039 grams (60°–80°) The ratio of increase also rose with the temperature, being greatest between 60° and 80° In the above series the determinations were made in neutral solutions , in the following, 15 c c of formic acid was added.

Copper taken Grams.	Copper deposited Grams.	Free acid c c	H_2O c c	Time. Hours	Temperature in degrees Cent.
(1) 1007	0104	15	150	[illegible]	20°
(2) "	0164	"	"	"	40°
(3) "	.0337	"	"	"	60°
(4) "	.0319	"	"	"	80°

The distance between the poles was 2 9 cm , area of electrodes (3 5 cm. × 3 6 cm.) × 2, current strength 7 5 c.c OH gas per minute. The ratio of increase was : (20°–40°) 0060 grams, (40°–60°) .0073 grams, (60°–80°) .0089 grams. A comparison between the two series of results would indicate that the presence of dilute free acid in moderate quantity exercises no material influence on the amount of metal deposited, even at elevated temperatures

III THE INFLUENCE OF POLE SEPARATION UPON THE PRECIPITATION OF COPPER.

	Copper taken Grams.	Copper deposited Grams.	H_2O. c c	Time Hours.	Distance between electrodes. cm
(1)	1974	0133	700	1	1 58
(2)	"	0106	"	"	3 16
(3)	"	0093	"	"	4 75
(4)	"	0081	"	"	6 33
(5)	"	0078	"	"	7 91
(6)	"	0073	"	"	9 50
(7)	"	0061	"	"	12 66

The area of the electrodes was (3 6 cm × 3.48 cm) × 2, free acid present 10 c c (1) was slightly spongy (7) was very close to the edge of the dish The diminution was (1–2) .0027 grams, (2–3) 0013 grams, (3–4) 0009 grams, (4–5) 0006 grams, (5–6) 0005 grams The current gave 1 75 c c. OH gas per minute

The foregoing experiments were performed in a crystallizing dish 15 2 cm. by 7.6 cm , with a capacity of 900 c c In the following series the determinations took place in a beaker 10 cm. in height by 7 6 cm. in diameter

	Copper taken Grams	Copper deposited Grams	H_2O c c.	Time. Hours.	Distance of electrodes. cm
(1)	1494	0302	200	1	1 58
(2)	"	.0248	"	"	3 16
(3)	"	.0208	"	"	4.75
(4)	"	0172	"	"	6 33

The current gave 1 75 c.c. oxyhydrogen gas per minute, area of electrodes (3 8 cm × 3 16 cm) × 2, free acid present 5 c c. The diminution was (1–2) 0054 grams, (2–3) 0040 grams, (3–4) .0036 grams In both series the rate of diminution rapidly lessened as the distance between the electrodes increased.

Experiments made under conditions similar to the above, except that no free acid was present, were failures, the deposits being exceedingly spongy

I. Influence of Dilution upon the Precipitation of Cadmium

	Cadmium taken	Cadmium deposited.	H_2O	Free acid.	Time	OH gas per minute
	Grams.	Grams.	c.c.	c c	Hours.	c c
(1)	.0994	....	100	none	½	1 75
(2)	.0497	....	"	"	½	"
(3)	.0994	....	"	.5	½	"
(4)	"	.0218	"	5	1	"
(5)	.0497	.0109	"	[illegible]	"	"
(6)	.0249	.0058	"	[illegible]	"	"
(7)	.0124	.0026	"	[illegible]	"	"
(8)	.0062	.0011	"	[illegible]	"	"

In (1) and (2) no free acid was added, and in (3) only .5 c c was present, all three were failures. The amount of acid was then increased to 5 c c, and the experiment repeated, all the other conditions remaining the same. The deposit was adherent and compact The poles were 3.16 cm apart, and had an area of (3 85 cm. × 3 8 cm) × 2

II. Influence of Temperature upon the Precipitation of Cadmium

	Cadmium taken	Cadmium found	H_2O	Free acid	H_2O gas per minute	Temperature in degrees Cent
	Grams	Grams	c c	c c	c c	
(1)	.1281	.0940	150	10	1 75	20°
(2)	"		"	"	"	40°
(3)	.0497	.0088	145	25	"	20°
(4)	"	.0110	"	"	"	40°
(5)	"	.0210	"	"	"	60°
(6)	"	.0257	"	"	"	80°

(2) was very spongy and was covered with a white gelatinous deposit resembling cadmium hydrate The amount of cadmium was then diminished more than half, while the amount of formic acid present was increased to 25 c c. (5) and (6) were somewhat spongy but adherent The increase was (20°-40°) .0022 grams, (40°-60°) .0100 grams, (60°-80) .0047 grams. The amount of metal deposited increased with rise of temperature, being greatest at 80°, but the greatest ratio of increase was at 60°, being almost five times greater than at 40°, and more than twice as great as at 80° These results were so different from those obtained with copper that a second series of determinations was made, in which the amount of cadmium in the solution was reduced still more in order to insure a compact deposit at the higher temperatures The results which were in close accord with those above are as follows.

	Cadmium taken	Cadmium deposited	H_2O	Free acid	OH gas per minute	Temperature in degrees Cent.
	Grams	Grams.	c c	c c	c c	
(1)	.0198	.0028	185	15	1 25	20°
(2)	"	.0031	"	"	"	40°
(3)	"	.0078	"	"	"	60°
(4)	"	.0109	"	"	"	80°

III. Influence of Pole Separation upon the Precipitation of Cadmium

	Cadmium present	Cadmium deposited	H_2O	OH gas per minute	Separation of electrodes.
	Grams.	Grams.	c c	c c	cm.
(1)	0994	...	700	2 8	1.66
(2)	"	.0059	"	1 25	"
(3)	"	0023	"	8	"
(4)	"	0009	"	"	3 16
(5)	"	.0009	"	"	6.33
(6)	"	....	"	"	12.66

Although 20 c c of free formic acid was present in (1) and (2) both were failures, the latter, though it was weighed, being merely approximate, some particles having been washed off. The current was then reduced to 8 c c HO gas per minute. Adherent deposits were obtained, but in such small quantity that (6) yielded only a trace. The ratio of diminution was (3–4) 0014 grams, (4–5) 0007 grams. Area of electrodes (3.8 cm × 3.48 cm) × 2, time 1 hour, free acid present 10 c.c.

I. Influence of Dilution upon the Precipitation of Zinc.

	Zinc present.	Zinc deposited	H_2O	Free acid	OH gas per minute
	Grams	Grams	c c	c c	c c
(1)	1250	.0600	100	.5	1 75
(2)	0025	0155	"	.25	"
(3)	1250	.0178	"	5.	"
(4)	0625	.0083	"	[illegible]	"
(5)	0313	.0043	"	[illegible]	"
(6)	0156	.0028	"	[illegible]	"

(1), (2), (3) and (6) were spongy, especially the last. Distance between the poles 3 16 cm. Area (3 85 cm. × 3 8 cm) × 2, time one hour.

II Influence of Temperature upon the Precipitation of Zinc

	Zinc taken	Zinc deposited	H_2O	Free acid.	OH gas per minute	Temperature in degrees Cent.
	Grams	Grams	c c	c c	c c	
(1)	1539	.....	150	10	.8	20°
(2)	.1046	.0145	"	"	1 6	"
(3)	.1096	...	"	"	"	40°
(4)	0805	....	"	none	8	20°
(5)	"	....	"	"	.8	"
(6)	"	....	"	"	1 8	"
(7)	.0618	.0089	145	5	.9	"
(8)	"	.0019	"	"	"	40°
(9)	"	0010	"	"	"	60°
(10)	"	....	"	"	"	80°
(11)	"	....	"	"	"	"
(12)	"	....	"	none	"	"

(1), (3), (5) and (6) were very spongy. In (4), (10) and (11) no deposition of metal took place, (12) was spongy and was covered with a white coating of zinc hydrate. At 80° no metal was deposited in the presence of free acid provided the current was not too strong. The ratio of decrease with rise of temperature was (20°–40°) 10 grams, (40°–60°) 9 grams, (60°–80°) no deposit. The distance between the poles was 2.85 cm. Area of electrodes (3 8 cm. × 3 16 cm.) × 2. Duration of experiment, one hour.

III. Influence of Pole Separation upon the Precipitation of Zinc.

	Zinc taken	Zinc deposited.	Free acid	H_2O	OH gas per minute	Time	Distance between poles
	Grams.	Grams	c c	c c	c c	Hours.	cm
(1)	.0102	.0046	10	700	1 9	3	1 58
(2)	"	.0033	"	"	"	"	3 16
(3)	"	.0015	"	"	"	"	6 32
(4)	"	.0008	"	"	"	"	12 66

Area of electrodes (3 8 cm × 3 48 cm.) × 2. The deposit was firm and compact. Compared with the results obtained with copper and cadmium, the result in (4) is too low.

Lead (Determined Electrolytically).

On account of tendency of lead and manganese to separate in the form of peroxide at the positive pole, it was deemed advisable to make a series of experiments on the metals themselves before attempting to effect their separation. The results were as follows:

	Lead taken	Lead found	Free acid	H_2O	OH gas per minute	Time	Difference from theory
	Grams.	Grams	c c	c c	c c	Hours.	
(1)	.1153	.	5	100	1	16	....
(2)	"	....	20	"	1 2	48	. .
(3)	"	....	5	"	2 8	8	....
(4)	"	...	20	"	"	16	....

50 c c. of a lead formate solution were used in each of the above experiments. In all of them, the lead was deposited in a spongy state at the kathode with more or less peroxide on the positive pole.

As the moist metal deposited on the kathode rapidly oxidizes, even when adherent and compact, the results obtained are invariably too high and in practice it is customary to estimate lead as peroxide on the anode securing its deposition in that form by the addition of nitric acid to the solution. The results obtained with free formic acid, as given above, were not such as to justify attempting its separation from either copper, cadmium or zinc.

Manganese (Determined Electrolytically)

	Manganese taken	Manganese found.	Free acid.	H_2O	OH gas per min.	Time	Difference from theory
	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0554	.0552	5	100	2.2	17	—.36
(2)	"	.0556	"	"	2.7	18	+.36
(3)	.1108	.1101	20	"	2.8	24	—.63
(4)	.0554	. . ..	30	"	1.6	16	. ..

The platinum dish was made the anode, the wire spiral serving as the negative pole. With small quantities of free acid, (1) and (2), considerable peroxide of manganese separated on both poles, with larger quantities, (3) (4), only very slight traces were found on the kathode. The deposition in (4) was not complete. The peroxide formed a black, lustrous coating on the dish, adherent while moist, but scaling off upon being heated.

The manganese which separated on the kathode was removed by means of a small piece of filter paper, which was ignited and the ash added to the contents of the dish, which was then raised to an intense heat in order to convert the peroxide of manganese into Mn_3O_4, in which form it was finally weighed. Traces of Mn were found in solution (3).

ELECTROLYTIC SEPARATIONS.

Cadmium from Manganese.

	Cadmium taken	Manganese taken	Cadmium found.	Free acid.	H_2O.	OH gas per min.	Time	Difference from theory
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage.
(1)	.0497	.0554	.0425	35	75	.8	16	....
(2)	"	"	.0440	"	"	1	"	....
(3)	"	"	.0498	25	"	2.7	17	+.20
(4)	.0511	"	.0509	20	"	2.4	19	—.39
(5)	"	"	.0697	5	150	2.7	18	..
(6)	.1022	.1108	.1098	20	75	2.5	17	....
(7)	"	"	...	40	100	2.8	45	...
(8)	.0511	.0554	.0514	30	75	2.7	18	+.58

In the preliminary experiments on manganese alone, it was found that the presence of 20 c.c. of free acid was sufficient to prevent the deposition of any peroxide on the kathode, except in the very slightest traces; but the presence of cadmium in the solution seemingly had a contrary effect, as the presence of even 40 c.c. of acid failed to prevent the separation of traces of manganese on the negative pole (7). In (5), to which 5 c.c. of free acid had been added, the deposit of peroxide of manganese upon the negative pole was almost five times greater than in a solution of manganese to which no cadmium had been added, all the other conditions being the same. In all the above experiments the platinum dish was used as

the anode, the platinum crucible serving as the negative electrode In (1) and (2) the cadmium was not completely deposited Traces of cadmium were found in (6) and (7) More or less manganese was found in all the deposits, but only in traces in the presence of more than 20 c c. of free acid, (4) and (7) were very spongy, the others were slightly so at the periphery of the crucible, but adherent. The best results were obtained by fulfilling the conditions described in (3), (4) and (6), but to obtain a compact deposit of cadmium free from all traces of manganese, it is evident that the amount of free acid must be increased and the poles separated Under these conditions, a stronger current must be employed than that furnished by the battery of "crowfoot" cells, with which my experiments were carried on

Zinc from Manganese.

	Zinc taken	Manganese taken	Zinc found.	Free acid	H_2O.	OH gas per min	Time.	Difference from theory
	Grams.	Grams.		c c	c.c.	c c.	Hours.	Percentage
(1)	0569	.0554	.	30	90	2 3	17	.
(2)	"	"	. ..	20	100	"	16	....

The dish served as anode, the crucible as kathode Both were failures; the zinc being spongy and containing MnO_2 and not entirely precipitated.

Copper from Zinc

	Copper taken	Zinc taken.	Copper found.	Free acid.	H_2O	OH gas per min.	Time	Difference from theory
	Grams.	Grams.	Grams.	c.c.	c.c	c c	Hours.	Percentage.
(1)	.1074	0818	.	5	100	1 3	46	. .
(2)	"	"	....	"	"	1 2	17	. ..
(3)	"	1124	. .	"	"	8	16	.
(4)	"	0818	1072	15	"	"	"	— 18
(5)	"	"	1073	20	"	"	17	— 09
(6)	0987	"	0990	"	"	"	"	+ 30
(7)	"	"	0984	"	"	.6	16	— 30
(8)	1057	1006	1052	15	"	8	"	— 47
(9)	"	"	1061	"	"	"	18	+ 37
(10)	"	"	.1058	"	150	"	"	+ 09
(11)	"	"	1059	20	"	"	19	+ 18
(12)	"	"	1053	"	"	"	21	— 37
(13)	"	"	1060	"	"	"	16	+ 28

As will be seen from the above, it was possible to separate copper free from zinc, except the slightest traces, by using a weak current in solutions to which 15–20 c.c. of free formic acid had been added. By employing stronger currents, or diminishing the amount of free acid, the copper was deposited admixed with considerable quantities of zinc If the necessary precautions are observed no zinc will be deposited, and the copper will be compact and adherent.

CADMIUM FROM ZINC.

	Cadmium taken	Zinc taken	Cadmium found	Free acid	H_2O	OH gas per min	Time.	Difference from theory
	Grams	Grams.	Grams.	c.c	c.c.	c c	Hours	Percentage
(1)	1031	0818	.	15	100	2	17	. . .
(2)	"	"	1239	20	"	6	19	— 16
(3)	"	"	1234	"	"	"	43	+ 24
(4)	"	"	1426	25	"	1 25	16	+15.88
(5)	"	"	1238	30	"	.6	"	+ 16
(6)	0403	0409	. . .	15	"	"	"	. . .
(7)	"	"	0642	"	"	1 25	"	.
(8)	0984	.1026	0982	25	"	6	19	. . .
(9)	0492	0409	.0494	15	"	"	41	+ 40
(10)	0984	1026	1733	85	75	1 25	17	. . . .
(11)	"	"	0722	"	"	6	"	.
(12)	"	"	0982	25	125	"	16	— 20
(13)	"	"	0985	"	"	"	16	+.10
(14)	1004	.1006	1001	"	"	1	48	—.29
(15)	"	"	0993	"	"	"	17	—1 09
(16)	"	"	1000	"	"	"	"	— 39
(17)	"	"	.1001	"	"	"	18	— 29
(18)	"	"	.1008	"	"	"	20	+ 39
(19)	"	"	0999	"	"	"	16	— 49

The first seven determinations were made in a platinum dish weighing about 67 grams, the remainder in a much larger dish weighing 117 grams. The results obtained with the latter were not as satisfactory as with the smaller dish (2) (3) (5), although a qualitative examination of the deposit and solution proved that the separation was complete (9) (12–19). The distance between the poles materially influences the results. In (6) the positive pole was in close contact with the dish; the cadmium contained zinc. In (9) the conditions were similar in all respects to the preceding, except that the distance between the poles was 2 5 cm.; the deposit was free from zinc. With 2 c.c. OH gas per minute, only a small quantity of the cadmium was separated (1), the greater portion remaining in solution. With 1.25 c.c., on the other hand, the zinc was deposited as a dark gray coating upon the cadmium (7), even in the presence of 85 c.c. of free acid (10). In solutions containing .10 grams of each metal a current of .8–1 c.c. HO gas per minute sufficed to secure a satisfactory deposit in the presence of 25 c.c. formic acid (12–19). With smaller quantities of métal (9) 15 c.c. of free acid was sufficient. The deposits in the above experiments were adherent and compact. There was no tendency to sponginess even in deposits containing large quantities of zinc.

Copper from Cadmium

Copper taken.	Cadmium taken	Metal deposited.	Free acid	H_2O	OH gas per min	Time	Difference from theory
Grams.	Grams.	Grams.	c c	c c.	c c.	Hours	Percentage
.1074	.0984	2061	10	100	8	17	.

This result was not unexpected, considering what we have already learned in regard to the behavior of these metals. The deposit was very dark and spongy. Both metals were completely precipitated Two subsequent experiments were equally unsatisfactory, in one the current was reduced to 8 c c. OH gas per minute; in the other, 25 c c of formic acid was added. No separation was effected

Copper from Iron

	Copper taken.	taken	Copper found	Free acid	H_2O	OH gas per min	Time	Difference from theory
	Grams.	Grams	Grams.	c c	c c.	c c	Hours.	Percentage.
(1)	1067	.1248	1085	25	125	8	20	
(2)	"	"	....	"	150	"	42	..
(3)	"	"	1019	"	"	"	19	.
(4)	"	"	.0609	"	"	"	17	.
(5)	"	"	.1014	"	"	"	18	. .

Although free acid was present in considerable quantity (25 c c), the formate of iron in the solution was decomposed with the formation of ferric hydrate, which separated as a light yellow froth on the surface of the solution It also formed crusts at the edge of the copper deposit, which adhered to the dish with such tenacity that all attempts at removal by mechanical means were failures Mere washing was without avail, and more energetic measures resulted in a loss of copper, (1) and (4) Dilute hydrochloric acid was added to (2), but, while it dissolved traces of copper, it failed to remove the deposit of iron hydrate Dilute sulphuric acid was also tried without success (3) In the final determination 20 c c of concentrated oxalic acid was added at the end of seventeen hours and the current allowed to act one hour longer The froth floating on the surface was dissolved, but the deposit on the copper was not appreciably affected. Except at the periphery the copper had a bright metallic lustre and was firm and adherent

Cadmium from Iron.

	Cadmium taken.	Iron taken.	Cadmium found.	Free acid.	H_2O	OH gas per min	Time
	Grams.	Grams	Grams	c.c.	c c.	c c	Hours.
(1)	.0984	.1248	.0996	25	150	8	23
(2)	"	"	1021	"	"	"	45

The same trouble was experienced here. Similar attempts were made to remove the iron, but without success. In the first of the above determinations 10 c.c. of oxalic acid solution was added before the conclusion of the experiment, in the latter, 20 c c. of the same solution.

The hydrate of iron in the solution disappeared, but adherent crusts still remained on the surface of the cadmium.

Zinc from Iron.

Several tentative experiments were made, but as the iron showed the same tendency to separate on the sides of the dish, as in the preceding determinations, they were not continued

Copper from Cobalt

	Copper taken	Cobalt taken	Copper found	Free acid.	H_2O	Oll gas per min	Time.	Difference from theory
	Grams	Grams.	Grams.	c c	c c.	c c.	Hours.	Percentage.
(1)	1101	1060	.1105	100	175	1	21	+.36
(2)	"	"	1095	"	"	"	17	—.54
(3)	"	"	1097	"	"	"	"	—.36
(4)	"	"	1107	"	"	"	18	+.54
(5)	"	"	1098	"	"	1 2	17	—.27
(6)	"	"	1097	"	"	1	16	—.36

On attempting to prepare a solution of cobaltous formate for the above determinations, it was found that the salt made according to the method already described was not readily soluble in water The solution was therefore prepared by double decomposition as follows 500 c c. of water containing 6 568 grams of sodium formate was mixed with an equal amount of water in which 8.728 grains of cobalt chloride had been dissolved.

Of this solution 50 c c. was taken, containing .1080 grams of cobalt. The distance between the poles was 3 8 cm except (1) and (4) in which it was 2.8 cm Both of the latter were spongy, the others slightly so. As the conditions, otherwise, were similar, the difference in the character of the deposits was apparently due to the separation of the poles. Traces of cobalt were found in all the copper deposits. The copper was all out except in (3), (5) and (6), in which the solutions were colored yellowish brown on the addition of hydrogen sulphide

The copper deposit was dark in color and adherent, although not very compact on the bottom of the dish.

Copper from Nickel.

	Copper taken.	Nickel taken.	Copper found	Free acid.	H_2O.	Oll gas per min	Time.	Difference from theory
	Grams.	Grams.	Grams.	c c.	c.c.	c c.	Hours.	Percentage
(1)	1101	1028	1095	75	175	1	20	— 54
(2)	"	"	.1097	100	"	"	17	— 36
(3)	"	"	"	"	"	"	18	— 36
(4)	"	"	1098	"	"	1 2	17	— 27
(5)	"	"	1096	"	"	1	"	—.46
(6)	"	"	.1098	"	"	"	"	— 27

The same trouble was experienced in preparing a satisfactory solution of pure nickel formate as with cobalt and it was found advisable to prepare the solution by double decomposition in the same way as the latter salt, 500 c.c. of this solution contained 8 8077 grams of nickel chloride and 6 3469 grams of sodium formate. In both cases a slight excess of sodium formate was used The copper contained traces of nickel and slightly colored the solution when tested with hydrogen sulphide The conditions were similar to those given under cobalt and the results were quite as satisfactory. The copper was bright and compact.

CADMIUM FROM COBALT.

	Cadmium taken.	Cobalt taken	Cadmium found.	Free acid	H_2O.	OH gas per min	Time	Difference from theory
	Grams.	Grams.	Grams.	c c.	c c	c c.	Hours.	Percentage.
(1)	.0984	.1080	...	25	100	5	22	...
(2)	"	"	..	"	150	8	45	..
(3)	"	"	. ..	50	"	1 5	18	.

It was naturally expected that cadmium would be completely precipitated from cobalt and nickel by employing a weak current, but from an examination of the above results, it will be seen that a separation was not accomplished

Even with a current of 1 5 c c OH gas per minute, the cadmium failed to deposit completely and was contaminated with cobalt (3) (1) was very spongy and the solution still contained cadmium at the expiration of 22 hours. The current was then increased and allowed to act for 45 hours (2) Cadmium was found in the solution, cobalt in the deposit. The distance between the electrodes was 2 8 cm.

CADMIUM FROM NICKEL.

	Cadmium taken.	Nickel taken	Cadmium found.	Free acid	H_2O	OH gas per min	Time.	Difference from theory
	Grams	Grams	Grams.	c c.	c c	c c.	Hours.	Percentage
(1)	0984	1028	0758	35	150	5	19	...
(2)	"	"	.1043	"	"	1 5	21	.
(3)	"	"	1348	50	125	1 5	17	. .

The results were quite as unsatisfactory as with cobalt. Cadmium was found in all three solutions, and more or less nickel was found in the deposits. In (3) the nickel came out as a gray deposit on the cadmium. The deposit was firm and adherent, although dark in color The distance between the electrodes was 2 5 cm., except (3), in which the pole separation was 2.8 cm

ZINC FROM COBALT

	Zinc present.	Cobalt present	Zinc found.	Free acid.	H_2O	OH gas per min	Time	Difference from theory
	Grams.	Grams.	Grams.	c.c.	c.c.	c.c.	Hours.	Percentage
(1)	1006	.1080	....	50	175	8	17	....
(2)	"	"	....	100	"	5	18	....

ZINC FROM NICKEL.

	Zinc present	Nickel present	Zinc found.	Free acid.	H_2O	OH gas per min	Time.	Difference from theory
	Grams.	Grams.	Grams.	c c.	c c	c c	Hours	Percentage.
(3)	1006	.1028	...	50	175	9 7	18	. ..
(4)	"	"	....	100	"	5	"	....

(3) and (4) were performed under similar conditions. The distance between the poles was 2 3 cm The current was generated by a battery of Bunsen cells Even with a current of 3 c c. gas per minute zinc was found in the solution in traces, while considerable quantities of cobalt and nickel separated as a coating upon the cadmium (1) and (3) were also failures. A separation was not obtained even approximately

SUMMARY.

As a result of the foregoing experiments, it was found that the amount of copper, cadmium or zinc deposited in a given time was proportional to the strength of the solution, and that the presence of free acid in moderate quantity did not materially affect the result

Increasing the distance between the poles resulted in diminishing the amount of metal deposited, but the rate of decrease diminished as the distance between the electrodes increased.

Elevation of temperature caused an increase in the amount of metal deposited, the rate of increase being greatest at 80° in neutral and acid copper solutions, and at 60° in cadmium solutions containing free acid. On the other hand, the amount of zinc deposited in solutions, to which free acid had been added, diminished as the temperature rose, nothing being deposited at 80°

Attempts to secure compact and adherent deposits of cadmium and zinc in neutral solutions were failures.

In acid solution copper and cadmium separated completely and satisfactorily The zinc deposits were spongy, but the precipitation was complete

Lead was mainly deposited on the negative pole, both in neutral and acid solutions. Manganese was precipitated on both poles, but the amount of peroxide separating on the kathode was reduced to mere traces by the presence of free acid.

The following separations were satisfactorily accomplished copper from zinc, cobalt and nickel and cadmium from zinc and manganese.

Attempts to deposit copper in the presence of iron and cadmium, and zinc in the presence of iron, cobalt and nickel, were successful Nor was it possible in the presence of the last three metals named to estimate cadmium.

In conclusion, I wish to express my obligations to Prof Edgar F. Smith, at whose suggestion the work was undertaken To his supervision and advice is largely due whatever value may attach to these results.

Stated Meeting, September 4, 1891

Present, 8 members.

President, Mr. FRALEY, in the Chair.

Letters of acceptance of membership were received from Dr. Caspar René Gregory, Leipzig, Germany, Dr. E T Hamy, Prof. E. Mascart, Dr Julius Oppert, Prof A De Quatrefages, Paris, France; Prof W Cawthorne Unwin, Kensington, England; Rt. Rev. William Stubbs, D D, LL D., Bishop of Oxford, England; Sir Robert S Ball, Dublin, Ireland, Prof. Charles E Monroe, Newport, R I, Prof Henry W Spangler, University of Pennsylvania.

Dr. Harrison Allen, of Philadelphia, resigned by letter from membership in the Society.

On motion, the resignation was accepted.

Letters of envoy were received from the Geological Survey of India, Calcutta; Académie Royale des Sciences, Amsterdam; Société Royale des Sciences, Upsal, Naturforschende Verein, Brünn, Austria, K Geodatische Institut, Berlin, Schlesische Gesellschaft für Vaterlandische Cultur, Breslau, Verein für Naturkunde, Cassel, K. Sachs. Meteorologische Institut, Chemnitz, Siebenbürgische Verein für Naturwissen, Hermanstadt, Leopoldinisch-Carolinische Akadémie, Halle, Società Italiana Delle Scienze, Rome, Société des Antiquaires de Picardie, Amiens, Académie des Sciences, Arts et Belles-Lettres, Caen; Musée Guimet, Ecole Polytechnique, Bureau des Longitudes, Paris; Manchester Literary and Philosophical Society; Meteorological Office, London, Royal Irish Academy, Dublin; Smithsonian Institution, Washington.

Letters of acknowledgment were received from the Geological Survey of India, Calcutta (134); Tokyo Library, Anthropological Society, Asiatic Society of Japan, Tokyo (134); Comité Geologique de la Russie, St Petersburg (134); Dr. Otto Donner, Helsingfors, Finland (134), Royal Danish Geographical Society (131–134), Prof. J S. Steinstrup (134),

Copenhagen, K. K. Central-Anstalt für Meteorologie, etc., Drs A Brezina, E. Suess, Friederich Muller, Vienna (134), Hungarian Academy of Sciences (128–131), Prof. Paul Hunfalvy, Budapest (130–133), Naturforschende Gesellschaft des Osterlandes, Altenberg (134); Gesellschaft für Erdkunde (134), K Geodatische Institut, Berlin (131–134); Naturhistorische Verein, Bonn (129), Naturwissenschaftliche Verein, Bremen (134), K Sächsische Meteorologische Institut, Chemnitz (131–134), Naturforschende Gesellschaft, Emden (134), Naturwissenschaftliche Verein des Reg. Bez., Frankfurt (130), Dr A Weisbach, Freiberg (134), K Leopoldinisch-Carolinische Akademie, Halle a S (103, 130–133, and Trans., xiv, 3); Geographische Gesellschaft (131), Deutsche Seewarte (131–134), Hamburg; Prof. Hermann Kopp, Heidelberg (131–134), Naturhistorische Gesellschaft, Hannover (134), K Sachsische Gesellschaft der Wissenschaften, Dr. Julius Platzman, Prof J Victor Carus, Dr Otto Bohtlingk, Leipzig (134), Naturwissenschaftliche Verein, Osnabruck (131–134); K. Sternwarte, Munchen (134), Verein für Vaterlandische Naturkunde, Wurtemberg (129, 130).

Accessions to the Library were announced from the Institut Egyptien, Cairo; Geological Survey of India, Calcutta, Government Astronomer, Madras; Norwegische Meteorologische Institut, Christiania; Société Roumaine de Geographie, Bucharest, Nederlandsche Botanische Vereeniging, Nijmegen; Friesch Genootschap voor Geschied, etc., Leuwarden, Académie Royale des Sciences, Prof Ad De Ceuleneer, Bruxelles, Augustus R. Grote, Bremen; Tudomanyos Akademia, Budapest, Ostschweizerische Geogr.-Commerc Gesellschaft, St Gall, M Ferdinando Borsari, Naples; M A. Del Bon, Padua, Profs. Léon de Rosny, Emile Schwærer, Edward Pepper, Paris; Le Comte de Charencey, St Maurice; Mr. Samuel Timmins, Coventry, England, Philosophical and Literary Society, Leeds, Mr James L. Bowes, Liverpool, Meteorological Council, Society for Psychical Research, Profs Joseph Prestwich, Thomas E Pickett, London, Nova Scotian Institute of Natural Science, Halifax, Hemenway Expedition, Mr. Robert T.

Swan, Boston; Scientific Alliance, American Museum of Natural History, Prof. Edward V. D'Invilliers, New York; Empire State Association of Deaf-mutes, Rome, N. Y., Mr. William E. Griffis, Schenectady; Mr. Charles Earle, Princeton; Mr. Samuel F. Bigelow, Newark, Geological Survey of New Jersey, Trenton, Academy of Natural Sciences, Hon. Charles O'Neill, Messrs. R. Meade Bache, Henry Phillips, Jr., Drs. J C. Morris, Charles A. Oliver, Persifor Frazer, J E. Ives, Edmund J. James, W. S. W. Ruschenberger, Miss Emily Phillips, Philadelphia, Wyoming Historical and Geological Society, Wilkesbarre; Historical Society of Delaware, Wilmington, Department of the Interior, Smithsonian Institution, Col. Garrick Mallery, Messrs. A C Peale, W. H. Seaman, Lester F Ward, Washington, D. C.

A photograph of the Mansion and Graves of the Penn family, in England, was received from Mr. F Gutekunst, Philadelphia.

Photographs for the Society's Album were received from Mr. Samuel Timmins, Coventry, England; Mr. Louis Vossion, Philadelphia, and Prof. Robert W. Rogers, Carlisle, Pa.

The death of James Russell Lowell (Boston, Mass., August 12, 1891, æt. 72) was announced.

Pending nominations 1230 and 1231 were read.

And the Society was adjourned by the President.

Stated Meeting, September 18, 1891.

Present, 2 members.

President, Mr FRALEY, in the Chair

Letters of envoy were received from the Colonial Museum of New Zealand, Wellington, Observatoire Physique Central, St. Petersburg, Université Royale de Norvége, Christiania; Musée Teyler, Harlem, Holland, K. Preussische Meteorolo-

gische Institut, Berlin; Musée Guimet, Paris; Royal Observatory, Greenwich; Zoölogical and Royal Statistical Societies, London, Bureau of Statistics of Labor, Boston; U. S. Coast and Geodetic Survey, Washington

Letters of acknowledgment were received from the Naturforschende Gesellschaft, Bern (134); University, Basle (134); Société Royale de Zoologie Natura Artis Magistra (134), Academie Royale des Sciences (127–130, and Trans., xvi, 2, 3), Amsterdam, Royal Library, (134), K. Zoologische Botanische Genootschap, 'S Gravenhage (134); Royal Netherland Museum of Antiquities, Leiden (134), K. Danske Videnskabernes Selskab, Copenhagen (130, 131, and Trans. xvi, 3); Société Royale des Sciences, Upsal (125–129), Bibliothèque Royale de Belgique, Bruxelles (131–133); Marquis Antonio de Gregorio, Palermo (134); R. Accademia di Scienze, etc., Modena (125–129 and Trans. xvi, 2), Università, Pisa (134), R. Comitato Geologico, Rome (134), R. Biblioteca N. C., Firenze (134); R. Osservatorio, Turin (134), Société Linnéene, Bordeaux (134); Prof. Lucien Adam, Rennes, France (134), Bureau Centrale Météorologique (131–134), Société D'Anthropologie, "Cosmos," Marquis de Nadaillac, M. A Des Cloizeaux, Paris (134); Sir Henry Thompson, London (134); Mr. Samuel Timmins, Coventry, England (134), Philosophical Society, Prof Dr. J P. Postgate, Cambridge, England (134), Royal Institution, Victoria Institute, Royal Astronomical Society, Linnean Society, Royal Society, Society of Antiquaries, London (134), Geographical Society, Manchester (131–134), Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne (134), Royal Dublin Society (134), Prof. James Geikie, Royal Observatory, Royal Society, Royal Scottish Geographical Society, Edinburgh (131–133); Free Public Library, Jersey City (131–134), Prof Thomas Chase, Providence (131–133), Drs. E D. Cope, W. G. A Bonwill, J. M. Maisch (134), "National Baptist," Philadelphia; University of California, Prof. Joseph Le Conte, Berkeley, Cal (134), Prof. Daniel Kirkwood, Riverside, Cal. (134); Free Public Library, Mr. George Davidson, San Francisco (134).

Letters of acknowledgment (185) were received from the Canadian Institute, Toronto, Geological Survey, Ottawa, Mr. Horatio Hale, Clinton; Nova Scotian Institute of Natural Science; Maine Historical Society, Society of Natural History, Portland; Vermont Historical Society, Montpelier, Prof. C. H Hitchcock, Hanover, N. H , Massachusetts Historical Society, State Library of Massachusetts, Hon Robert Winthrop, Mr. Hamilton A. Hill, Boston; Museum of Comparative Zoology, Mr. Robert N. Toppan, Prof. J. D. Whitney, Cambridge, Mass.; Essex Institute, Salem, Free Public Library, New Bedford; Dr Pliny Earle, Northampton, American Antiquarian Society, Worcester, Rhode Island Historical Society, Providence Franklin Society, Providence; Prof. Charles E Monroe, Newport, New Haven Colony Historical Society, Connecticut Historical Society, Hartford; Buffalo Library, Prof E. North, Clinton, N. Y ; Profs T F. Crane, J M Hart, B. G Wilder, Ithaca; Vassar Brothers Institute, Poughkeepsie, Oneida Historical Society, Utica, U S Military Academy, West Point, Prof. Henry M. Baird, Columbia College, Astor Library, American Museum of Natural History, New York Hospital, Academy of Medicine, University of the City of New York, Historical Society, Meteorological Observatory, Prof J. J Stephenson, Capt. R. S. Hayes, New York, Rev Joseph F. Garrison, Mr Isaac C. Martindale, Camden; Free Public Library, Jersey City, New Jersey Historical Society, Newark, Nassau Hall Library, Prof C. A Young, Princeton, Dr. R. H Alison, Ardmore, Prof Martin H. Boyé, Coopersburg; Hon Eckley B Coxe, Drifton, Dr. Traill Green, Profs. J. N Moore, Thomas C Porter, Easton; Mr. Andrew S. McCreath, Harrisburg; Mr Ario Pardee, Hazleton; Mr. John Fulton, Johnstown, Linnean Society, Lancaster; Mr Peter F. Rothermel, Linfield; Prof. John F. Carll, Pleasantville, Mr. Heber S. Thompson, Pottsville; Rev F A. Muhlenberg, Reading; Mr. M. Fisher Longstreth, Sharon Hill; Philosophical Society, Messrs. William Butler, Philip P. Sharples, West Chester; Mr. Thomas Meehan, Germantown, Wagner Free Institute of Science,

Academy of Natural Sciences, Zoological Society, Pennsylvania Hospital, Library Company of Philadelphia, Messrs. R. L. Ashhurst, John Ashhurst, Jr., R. Meade Bache, W. G. A. Bonwill, Charles Bullock, Cadwalader Biddle, S. Castner, E. D. Cope, J Solis Cohen, Thomas M. Cleeman, Paterson Du Bois, Robert P Field, Persifor Frazer, George Froebis, Frederick A. Genth, Frederick A. Genth, Jr., H. D Gregory, Joseph S Harris, Lewis M Haupt, William A. Ingham, W. W. Jefferis, John Marshall, J. W. Maisch, James T. Mitchell, Charles A. Oliver, Franklin Platt, Robert Patterson, C. Stuart Patterson, C. N Peirce, Henry Phillips, Jr., William Pepper, Frederick Prime, Theodore D Rand, W S W. Ruschenberger, L A. Scott, Coleman Sellers, Carl Seiler, Albert H Smyth, H. W. Spangler, H C Trumbull, W. P. Tatham, D K. Tuttle, Talcott Williams, Joseph Wharton, Louis Vossion, Philadelphia, Maryland Historical Society, Peabody Institute, Institute for the Promotion of the Mechanic Arts, Baltimore; U S. Naval Institute, Annapolis, Smithsonian Institution, Weather Bureau, U S Coast and Geodetic Survey, U. S. Geological Survey, U S Naval Observatory, Anthropological Society, Mr W. B Taylor, Surgeon General's Office, Dr. A S. Gatschet, Major J W Powell, Prof Herman Haupt, Capt. Thomas Jefferson Lee, Washington, D C; University of Virginia; Leander McCormick Observatory, Charlottesville, Virginia Historical Society, Richmond, Mr Jed. Hotchkiss, Staunton; Georgia Historical Society, Savannah; Cincinnati Society of Natural History, Cincinnati Observatory, Prof. E W. Claypole, Akron, O.; Dr Robert Peter, Lexington, Ky., Athenæum, Columbia, Tenn.; Geological Survey of Missouri, Jefferson City; Prof J C Branner, Little Rock, Ark, Col. William Ludlow, Detroit, Wisconsin State Historical Society, Madison, Davenport Academy of Sciences, Kansas State Historical Society, Topeka; Colorado Scientific Society, Denver, University of California, Prof Joseph Le Conte, Berkeley, Lick Observatory, Mt Hamilton, Cal.; Prof Daniel Kirkwood, Riverside, Cal.; Mr. George Davidson, San Francisco, Observatorio Astronomico Nacional Mexicano, Tacu-

baya; Sociedad Cientifica, "Antonio Alzate," Mexico; Bishop Crescencio Carrillo, Merida, Yucatan.

Accessions to the Library were announced from the Comité de Conservation des Monuments de L'Art Arabe, Cairo, Egypt; Royal Society of Tasmania; Secretary of Mines, Melbourne, Victoria; New Zealand Institute, Wellington; Tokyo Library; K. Akademie der Wissenschaften, St. Petersburg; M. O. A. L. Pihl, Christiania; Naturforschende Gesellschaft, Bamberg; K. P. Geodätische Institut, Association Géodésique Internationale, Berlin; Naturforschende Gesellschaft, Emden; Verein für die Geschichte und Altertumskunde, Erfurt; Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a. O.; K. Leopoldinisch-Carolinische Deutsche Akademie der Naturforscher, Halle a. S.; Schweizerische Naturforschende Gesellschaft, Bern; Société de Physique et d'Histoire Naturelle, Geneva; Biblioteca N. C di Firenze; Direzione Générale della Statistica, Rome; Ministère de l'Instruction Publique et des Beaux Arts, Société Americaine de France, Paris; Dr. John Evans, Hemel Hempstead; Natural History and Antiquarian Society, Penzance; Royal Society, Edinburgh; Bureau of Statistics of Labor, Boston; Dr J S. Newberry, New York; Departments of Labor, State, War, Smithsonian Institution, Mr. Sanford Fleming, Washington, D. C.; Col. Charles C. Jones, Augusta, Ga.; Mr. William Harden, Savannah; Dennison University, Granville, O.

Pending nominations Nos. 1280 and 1281 were read.

And the Society was adjourned by the President.

Stated Meeting, October 2, 1891.

Present, 9 members.

Vice-President, Dr. RUSCHENBERGER, in the Chair.

Letters of envoy were received from the Naturforschende Verein, Brünn; K. P. Akademie der Wissenschaften, Berlin;

K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Gesellschaft zur Beförderung der gesammten Naturwissenschaften, Marburg; Verein für Vaterländische Naturkunde in Würtemberg, Stuttgart, Museo Nacional de Buenos Aires; Oficina Meteorológica Argentina, Cordoba.

Letters of acknowledgment were received from the Imperial Academy of Science, Prof. Serge Nikitin, St. Petersburg (134), Societatea Geografica Româna, Bucharest (131–134), K Danske Videnskabernes Selskab, Copenhagen (134), Université R. de Norvège, Christiania (128–134), Société Entomologique de Belgique, Bruxelles (134); Fondation de P Teyler van der Hulst, Harlem (134); Naturforschende Verein in Brunn (128–133), Académie des Sciences, Cracow, Austria (134), Osservatorio Marittimo, Trieste (131–134); Section für Naturkunde des O. T. C., Vienna (134); K Geodätische Institut (135), K. P Meteorologische Institut (134), Deutsche Geologische Gesellschaft (135), Berlin, K Sächsische Altertums Verein, Dresden (134), Naturwissenschaftliche Verein des Reg.-Bez., Frankfurt a O. (134), Gr. Hess Univ. Bibliothek, Giessen (129): K Leopoldinisch-Carolinische Akademie, Halle a. S. (134); Verein für Thuringische Geschichte und Altertumskunde, Jena (134); Verein für Erdkunde, Metz (131–134), Dr. C. A Dohrn, Stettin (134), Verein für Vaterländische Naturkunde in Wurtemberg, Stuttgart (131–134 and Trans. xvi, 3), Prof Johannes Dumichen, Strasbourg (134), Prof Guido Cora, Turin (134), R Accademia di Scienze, etc., Modena (134); Societa Africana D'Italia, Naples (131–134); R. Accademia di Scienze, etc., Padua (131–134); M. A. Des Cloizeaux, Dr. E. T Hamy, Paris (135), Cte. de Charencey, St. Maurice les Charencey (131), Institution of Civil Engineers (129, 130), Sir James Paget (134), London; Mr Alfred R. Wallace, Parkstone, England (131–134), Prof. Robert W. Rogers, Carlisle (135); Col. Garrick Mallery (135), Prof C V. Riley (134), Smithsonian Institution, Washington, D. C, Museo Nacional, Dr. H. Burmeister, Buenos Aires (134); Instituto Fisico-Geografico Nacional, San José de Costa Rica (131–134); South African Philosophical Society, Cape Town (131–133).

Accessions to the Library were reported from the Tokyo Library, R. Accademia Degli Agiati, Rovereto, Austria, Naturwissenschaftliche Gesellschaft "Isis," Dresden; Société des Sciences Physiques et Naturelles, Bordeaux; Bureau des Longitudes, Paris; Société de Geographie, Toulouse; M Nicholas Ball, Block Island, R. I.; New York Forest Commission, Albany, American Museum of Natural History, Prof. J. S Newberry, New York; M. J. A. Udden, Rock Island, Ill.; Academy of Sciences, St. Louis; University of California, Sacramento, Observatorio Meteorologico-Magnetico Central, Mexico; Commissão Geographica e Geologica, San Paulo, Brazil; Museo Nacional Oficina Meteorologica Argentina, Buenos Aires, Direccion Central de Estadistica, Guatemala, C A.

The death of D Humphrey Storer, M.D, Boston, September 10, 1891, aged 87, was announced.

Prof. Cope offered a paper for the Transactions on the "Ophidians of North America," which was referred to Drs. Horn, Ryder and Heilprin

Dr. Horn made a communication on the genus Calospaste

Dr. Franz Boas, of Worcester, Mass., presented through the Secretaries a paper entitled, "Vocabularies of the Tlingit, Haida, etc., Languages."

Prof. Cope made some remarks on the results of a late expedition to the Gallapagos islands.

Pending nominations Nos. 1230 and 1231 were read.

And the Society was adjourned by the presiding member.

Stated Meeting, October 16, 1891.

Present, 17 members.

Vice-President, Dr. Ruschenberger in the Chair.

Correspondence was submitted as follows:

A circular was received from the Local Committee on Organization of Pan-Republic Congress and Human Freedom

League, inviting the Society to its reunion on October 12 and 13, 1891, at the State House and Academy of Music.

A circular from the Naturhistorische Gesellschaft zu Nürnberg, announcing the celebration of its ninetieth year.

A circular from the Académie Royale des Sciences de Lisbonne, announcing the death of its Secretary, José Maria Latino Coelho, on August 29, 1891

Mr. Paul Leicester Ford requested by letter the permission to consult the draft of the Declaration of Independence, now stored away with other valuable papers of the Society.

Letters from the President and Mr. W. S Baker were read in support of the request.

On motion, the Curators were authorized to restore to a place in the fireproof building of the Society its manuscript of the Declaration of Independence in the autograph of Thomas Jefferson.

Dr. Hays moved as an amendment "that it be kept in a fireproof safe."

The amendment, being put to a vote, was not agreed to, and the original motion was adopted by the Society.

On motion, it was resolved that Mr. Ford be permitted to have access to the document in question in the presence of one of the Curators of the Society

Letters of envoy were received from the Académie Royale des Sciences, etc., de Belgique, Bruxelles, Société des Sciences Physiques et Naturelles, Bordeaux, Bureau des Longitudes, École Polytechnique, Musée Guimet, Ministère des Travaux Publiques, Paris.

Letters of acknowledgment were received from the Royal Society of N. S. Wales, Sydney, Australia (134); Accademia degli Agiati, Roveroto, Austria (134); K. K. Naturhistorisches Hofmuseum, Dr Aristides Brezina, Vienna (135); Dr. Caspar René Gregory, Leipzig (135); Académie des Sciences, Belles Lettres et Arts, Bordeaux (134); Société de Géographie, Lille, France (135); École d'Agriculture, Montpellier (135), Muséum d'Histoire Naturelle (128); M Victor Duruy, Prof. A. de Quatrefages, Paris (135); Natural History and Philo-

sophical Society, Belfast (184), College of Pharmacy, Philadelphia (185); Central Meteorological Observatory, Mexico (185); Mr. Everard F. im Thurn, British Guiana (135).

Accessions to the Library were reported from the Société Royale de Géographie d'Anvers; Académie Royale des Sciences, Bruxelles; Geographische Gesellschaft, Bern; Naturhistorische Gesellschaft, Nürnberg; Accademia delle Scienze, Torino; Ministère des Travaux Publiques, Paris; Yorkshire Geological and Polytechnic Society, Halifax, England; Geological and Natural History Survey of Canada, Montreal Geological Society of America, Rochester, N. Y.; Free Public Library of Jersey City, Messrs. J. E Ives, Henry Phillips, Jr., Pennsylvania Prison Society, Philadelphia, U. S Department of Agriculture, U. S. National Museum, Washington, D. C., Mr. W. Curtis Taylor, Tacoma, Wash

A photograph was received for the Album from Dr. Caspar René Gregory, Leipzig.

The Committee appointed to examine Prof. Cope's paper, offered at the last meeting for the Transactions, reported that he desired to withdraw the same and recommended that the request be granted. On motion, the Society permitted the paper to be withdrawn.

The stated business of the meeting was then taken up, and pending nominations Nos. 1280 and 1281 were read, spoken to and balloted for.

The following minute was read from the Library Committee:

STATED MEETING, OCTOBER 10, 1891

The Chairman was authorized to report to the Society the suggestion that the fireproof for the valuable books and papers heretofore ordered by a vote of the Society, which order was not executed because of the absence of any sufficient foundation for the fireproof, be now carried into effect, as the walls of the building appear to be entirely sufficient for that purpose.

On motion, the Library Committee respectfully requested the Curators to indicate to the Committee what cases they will need for the purposes mentioned by Dr Morris to the Committee for the display of antiquities, etc.

Dr. Morris, on behalf of the Curators, stated the reasons why at present the Curators could not designate exactly how much was wanted; that much of the collections of the Society was as yet unpacked and temporarily inaccessible; that until the Curators knew how much space would be needed they could not designate it.

Mr. McKean moved that the Committee on Hall be requested to carry into effect the order of the Society, made several years ago, to procure a fireproof safe for the safe custody of the valuable books and papers of the Society, or to inform the Society, if they find such to be the fact, that the walls of the Society's building are not yet deemed strong enough to support such a safe.

Mr. DuBois inquired as to whether any limit had been placed as to the size and price of such a safe.

The Secretaries replied that in the original motion there was no limitation.

Dr. Cope suggested that a new base might have to be built to support so great a weight.

Dr. Greene suggested that several small safes might better serve the purpose than one large one.

Prof. Barker suggested that a vault could be erected in the basement of the Society's building as a receptacle for its documents.

On motion of Mr. McKean, the motion was referred to the Hall Committee.

All other business of the meeting having been disposed of, the Tellers reported the result of the voting for candidates to the Presiding Member, who declared that

2197. Prof. George Forbes, F.R.S., London,

2198. Mr. Joseph G. Rosengarten, Philadelphia,

had been duly elected members of the Society.

And the Society was adjourned by the President.

Stated Meeting, November 6, 1891.

Present, 31 members.

President, Mr. FRALEY, in the Chair

Mr. Joseph G. Rosengarten, a newly elected member, was presented to the Chair and took his seat.

Correspondence was submitted as follows:

A letter of acceptance of membership from Mr. Joseph G. Rosengarten, Philadelphia.

A letter from Mr. William Curtis Taylor, requesting exchanges on behalf of the Tacoma Academy of Science, Tacoma, Wash. On motion, the Academy was ordered to receive Proceedings from No. 96 and Catalog.

A letter from Mr. Joseph G. Rosengarten, in behalf of various persons, requesting the Society to accept their gift of a marble relief portrait of the late Mrs. Emma Seiler, and to fix a time for its formal presentation. On motion of Mr. Dudley, the gift was accepted and the 20th of November was selected.

Letters of envoy were received from the Société Imp. Russe de Géographie, St. Petersburg; Institut Météorologique de Roumanie, Bucharest; Meteorological Office, Royal Statistical Society, London; Royal Dublin Society, Royal Irish Academy, Dublin; Geological Survey of Pennsylvania, Harrisburg, Theological Seminary, Hartford, Conn

Letters of acknowledgment (185) were received from Prof Serge Nikitin, St. Petersburg; Anthropologische Gesellschaft, Vienna; Prof. Peter Ritter von Tunner, Leoben, Austria; Prof. Abel Hovelacque, Paris; Mr. Samuel Timmins, Arley, England; Philosophical Society, University Library, Cambridge, England; Victoria Institute, Linnean Society, Royal Society, Royal Meteorological Society, Messrs. C. Juhlin Dannfeld, P. L. Sclater, London; Manchester Geographical Society, Philosophical Society, Glasgow; Prof. Andrew A. Blair, Mr.

Joseph G. Rosengarten, Philadelphia, Kansas Academy of Science, Topeka.

Accessions to the Library were reported from the Société Imp. Russe de Géographie, St. Petersburg; Institut Météorologique de Roumanie, Bucharest; Bataviaasch Genootschap van Kunsten en Wetenschappen, Batavia, K. Akademie van Wetenschappen, Amsterdam; Instituto y Observatorio de Marina, San Fernando; Philological Society, Cambridge, England; Meteorological Council, London, Mr. Samuel Timmins, Arley, near Coventry, England; Mr. James B Francis, Lowell, Mass.; Massachusetts Historical Society, Boston, Hartford Theological Seminary, Mr. J. A. Spalding, Hartford, Geological Survey of Pennsylvania, Harrisburg, American Society for Extension of University Teaching, University Marine Biological Association, Prof Edwin J Houston, MacCalla & Company, Philadelphia, Commissioner of Pensions, Bureau of Education, U. S. Commission of Fish and Fisheries, Dr Albert S Gatschet, Washington, D. C.

The death of Hon William Morris Davis at Philadelphia, was announced as having occurred in October, 1891.

On motion of Secretary Brinton, the paper of Dr. Boas, on "Indian Languages," was ordered to be printed in the Proceedings.

A communication on "The Electrolysis of Metallic Formates," by Hill Sloane Warwick, was presented by Secretary Barker.

Curator Patterson Du Bois presented the following report on the examination, by Mr. Paul Leicester Ford, of the autograph copy of the Declaration of Independence owned by the Society

Notes on the Various Copies of the Declaration of Independence in Jefferson's Handwriting.

According to order the Society's copy of the Declaration of Independence was examined by Mr Paul Leicester Ford, in the meeting room of the Society, on Wednesday, October 21, 1891, in my presence as Curator. The following facts were obtained from Mr. Ford.

There were nine known MS. copies of the Declaration

1. Jefferson's original first draft is now in the possession of the Department of State at Washington. It contains five emendations by Franklin and two by John Adams.

2 On the 28th of June, 1776, a fair copy was submitted to Congress It was discussed on the 3d and 4th of July, and passed late in the day of the 4th of July There is no evidence that this copy, or any other, was signed, except by the regular official attests, on the 4th of July All traces of this copy have been lost for many years. The engrossed copy now in the Department of State at Washington, which is, of course, not in Jefferson's handwriting, was signed on the 2d of August following—some of the signers not having been in or members of the Congress on the 4th of July, while others who were there and voted for the Declaration were not among the signers.

Between July 4th and 8th, Jefferson wrote copies as follows

3 One for John Page

4 One for George Wythe.

5 One for Edmund Pendleton

6 One for Richard Henry Lee, the copy now in the possession of the American Philosophical Society, to which it was presented by Lee's grandson

7 In 1833, Jefferson wrote that he had given a copy to Mazzei, who had subsequently given it to a French countess Of this we know nothing further

8. A fair copy was written for Madison, perhaps fifteen years or so after the copies made in 1776 were written This is now in the possession of the Department of State

9. In 1821, Jefferson wrote a copy which he inserted in his autobiography

This Society has in its possession the letter, dated July 8, 1776, in which Jefferson presents to Richard Henry Lee the copy above numbered 6. Jefferson writes "I enclose you a copy of the Declaration of Independence as agreed to by the House, and also as originally framed, you will judge whether it is the better or worse for the critics" On July 21, Lee acknowledged it, and said "I wish sincerely, as well for the honor of Congress as for that of the States, that the manuscript had not been mangled as it is." On this Mr. Ford observes "In 1825, when this manuscript came into the possession of your Society, John Vaughan, who, I believe, was then your Secretary, wrote to Jefferson, asking him 'if it was the original draft.' To this Jefferson replied, stating it was not, but added 'Whenever in the course of the composition, a copy became overcharged and difficult to be read with amendments, I copied it fair, and when that also was crowded with other amendments, another fair copy was made, etc. These rough drafts I sent to distant friends who were anxious to know what was passing. . . . Whether the paper sent to R. H. Lee was one of these, or whether, after

'the passage of the instrument, I made a copy for him with the amendments of Congress, may, I think, be known from the face of the paper.' An examination of the paper proves conclusively that it is the latter, to which has been added an endorsement in the handwriting of Richard Henry Lee, and marginal notes in the handwriting of Arthur Lee, both of which are attested by Richard Henry Lee, the grandson of the former, on the document itself As Arthur Lee was absent from this country in 1776, and did not return to it till 1779, his notes must have been made subsequent to the latter date."

The underscoring and bracketing in the copies 3, 4, 5, 6 signify, then, that Congress either struck out or altered the phraseology of those passages.

Mr Ford desires me to return his hearty thanks to the Society for the privilege of examining the manuscript. It seems to me that the Society is likewise indebted to Mr Ford for the foregoing valuable information

PATTERSON DU BOIS, *Curator.*

The Treasurer, Mr. Price, presented a report from the Michaux Committee, as follows·

TO THE AMERICAN PHILOSOPHICAL SOCIETY

The Michaux Committee respectfully reports that at a meeting of the Committee, held on November 5, 1891, a letter was received from Dr. J T Rothrock, enclosing the following list of the subjects proposed for the Thirteenth Course of Lectures given under the auspices of the American Philosophical Society

1 Vegetation of the Bahamas and Jamaica (illustrated)
2 Vegetation of the Bahamas and Jamaica (illustrated)
3. Physical Geography of the Bahamas and Jamaica (illustrated)
4. Some Problems for the Future, arising from Forest Growth, Surface Drainage and State Lines.
5 Forestry in Pennsylvania
6. Relation of Forests to the Surface of the Earth.
7 Some Points in Practical Forestry

It is expected that the Lectures will be delivered in the Hall of the Academy of Natural Sciences, which has been kindly tendered to him by the Academy for that purpose

The Committee approved of the proposition and requests the Society to make an appropriation of $235 out of the income of the Michaux fund to meet the expenses of the Lectures.

In January, 1890, the Society made an appropriation of $200, out of the income of the Michaux fund, to Prof. Heilprin, towards the expenses of his expedition to Mexico and Yucatan, and your Committee has just received from him a paper entitled "Observations on the Flora of Northern Yucatan," in the nature of a report to it of his botanical work in that

country, which is herewith submitted as part of its report to be printed in the Proceedings of the Society.

The Committee submits the following resolutions, which it desires shall be passed by the Society

Resolved, That the sum of two hundred and fifty five dollars be appropriated out of the income of the Michaux fund towards the expenses of the Thirteenth Course of the "Michaux Forestry Lectures," by Dr. J T. Rothrock.

Resolved, That the paper of Prof. Heilprin, entitled "Observations on the Flora of Yucatan," as well as the paper presented by Dr Rothrock entitled "Some Observations on the Bahamas and Jamaica," in the nature of report to the Michaux Committee of his visit to these Islands in 1891, be printed in full in the Proceedings of the Society as part of the report of the Michaux Committee

By order of the Board,

J Sergeant Price, *Secretary*.

The resolutions, as reported, were adopted by the Society.

Observations on the Flora of Northern Yucatan.

By Prof Angelo Heilprin.

It is not a little singular that while the Mexican region as a whole has from the beginning of the century to the present day attracted the attention of botanists of all nations, and contributed more largely to the initial understanding of geographical botany than perhaps any other region of the globe, the Province or State of Yucatan should not have drawn to it a single botanist of note Indeed, it is only in the last few years that any systematic effort has been made towards the determination of its flora, even the relationship of which has not yet been precisely ascertained Grisebach, in his *Vegetation der Erde* (1884, Vol II, p 301), dismisses the region with the bare statement that unfavorable climatic and physical conditions prevent luxuriance of vegetable development, and Hemsley, in his report upon the botany of Mexico and Central America, prepared for Godman and Salvin's *Biologia Centrali Americana* (*Botany*, iv, p. 151, 1888), merely asserts our ignorance in the following words · "Before concluding this part, we may add that little is known of the details of the botany of Yucatan, except that it is very poor and scanty, and largely composed of plants that still bear long droughts without injury The poverty of the flora is ascribed to the fact that the copious rains rapidly filter away through the porous limestone substratum" Drude, in his *Handbuch der Pflanzengeographie* (1890), ignores the region entirely In view of this very limited knowledge of the flora of a country so interesting

as is Yucatan, I venture to submit a few general observations which were hastily picked up during a field reconnaissance made in the early part of 1890 (late February and March) principally in the interests of geological and zoological research. The collection of plants, which serves as a basis for some of the determinations referred to in this paper, was made by Mr. Witmer Stone, one of my associates in exploration, to whom I am indebted for notes and remarks on distribution, etc. I desire in this place also to acknowledge my indebtedness for various favors to D Emilio MacKinney, of Merida, Yucatan, the author of the now progressing *Nuevo Jadio*,* who has kindly assisted me in the determination of species not in flower, and of which specimens could not readily be obtained for our collections, and also furnished the local or Maya names

Perhaps the traveler's first surprise on landing in Yucatan is that his *eyes do not immediately fall upon a line of lofty primeval forest*, *secondly*, he may be distressed by the utter barrenness which at times distinguishes much of the region that is covered by the bush or "jungle." This is the condition throughout much of the dry season when the trees and bushes, instead of being buried in dense and brilliant verdure, are as bare as though they had just passed through the tail end of one of our northern winters The more striking does this condition appear when it is recollected that the region under consideration is well within the tropics, but little elevated above the level of the sea, and seemingly well fitted for the development of a rich and luxuriant flora In the region first visited by us—the flat limestone tract included between the seaboard and the capital city—the vegetation is monotonous to a high degree There is little of that variety of form which we are accustomed to associate with the vegetation of the south—little or nothing of the life which astonishes by its exuberance By far the greater number of the arboreal elements of the scrub—for it is more nearly scrub than either jungle or forest—belong to the group of the Leguminosæ, among which the *yaxhabin*† (a species of Cassia) and the dog acacia or *subinché* (*Acacia cornigera*), with their abatis of thorns, stand out as prominent members. Beyond the presence here and there of one or more species of cactus (*Cereus Peruvianus C flagelliformis, Cactus opuntia*) and the vision of distant cocoa-palms and oranges, there is little to remind the stranger from the north that he is not traveling in his own country There are no large foresters swinging garlands of evergreens to the breeze, no canopy of flowers to waft perfume to the air All about are tree like bushes, fifteen to twenty five feet in height, thin and so spare in their foliage as to permit of but indifferent shade, and most of them stocked with a wonderful armor of hooks and thorns. There are few flowers on the interground, and what appear on the branches above are almost wholly of a yellow color—the flowers of the Cassia and of the numer-

* *El Nuevo Jadio*, *Apuntes que serviran para la formacion de La Flora Yucateca.* Merida, 1889

† Pronounced with the German pronunciation of the vowels, yashabin The x which appears in many of the Maya or Yucatecan words, as in Uxmal, has the sound of sh.

ous associated Acacias. These may be taken to represent the white blossoms of our cherry and dogwood. Here and there the eye catches a glimpse of a solitary screw-pine, the ɔipil* of the Mayas (*Pandanus candelabrum*), a plant which seems to have pretty firmly engrafted itself upon the Yucatan flora.

Withal that is lacking to indicate a tropical flora there is equally little that is really distinctive of the northern woods; there are no oaks, maples, beeches, poplars, junipers, cedars or pines. Excepting the Acacias we failed to detect a single genus of northern forest trees.† Yet the total impression produced by the vegetation was one immediately suggestive of the north, and not of a flora intermediate in character between that of the north and that of the south. The largely denuded condition of the trees undoubtedly conduced towards this impression.

This is the picture of the limestone flats between Progreso and Merida, and of much of the region lying to the east, south and west of the capital city. It is the picture as we found it in the dry season, in the month of March, before nature had yet begun to respond to those refreshing influences which are the offering of the rainy season.‡ It was the tropical winter. But even at this season of the year there were pieces of landscape that were fragrant in their verdure. Wherever the hand of man had transformed the native scrub into the fertile but ever dreary and monotonous, hennequen country, with its countless aloes (*Agave rigida* var. *A. Sisalana*) planted in avenues of geometrical precision, the eye is sure to rest upon a number of scattered garden spots. They are the groves of the haciendas, and it is difficult to conceive of anything more brilliant or refreshing than these oases in what might be termed a fertile desert. The dense masses of foliage of the orange, *ramon* (*Brosimum alicastrum*), and one or more species of Ficus (*F. longifolia*), with their deepest tints of green, and the overarching plumes of the cocoanut, offer a sharp contrast to the bleak expanse of hennequen, and a picture of loveliness not soon to be forgotten.

Along the roadways and in the gardens of Merida numerous examples of the true arboreal vegetation of the tropics are to be met with. Conspicuous among these are the silk-cotton tree (*Bombax ceiba*) and the *bonete* or *kumché* (*Jacaratia Mexicana*), both of which assume the stately proportions of forest trees. At the time of our visit they were already in full fruit, although they as yet showed scarcely a vestige of leaf. This peculiarity, so novel to the stranger, was also true of most of the larger trees, such as the sapote (*Sapota achras*), pochote (*Eriodendron anfractuosum*), the so called native cedar or cedro (*Cedrela odorata*), etc. The

*The Maya ɔ, or reversed C, is pronounced as a short lingual ts.

†So many of the bushes and trees being destitute of leaf, and therefore largely unrecognizable, it is possible that more of the temperate forms are actually represented than appeared to us to be the case.

‡Returning to Progreso in the early part of June, I found that the vegetation, although considerably advanced, was still backward as compared with that of the eastern lowland plains of major Mexico, and in every way much less luxuriant.

plum or ciruela (*Spondias*) was also bearing heavily, but it still bore traces of flowering. One of the most ornamental trees of the roadside is the "southern pine" or *Casuarina*, which also thrives extensively in the open and windy sand spots of Progreso.

The tree which at the time of our visit gave the tone of luxuriance to the vegetation was the ramon (*Brosimum alicastrum*), the dense masses of whose foliage are a refreshing object in the street scenery of almost every town in northern Yucatan. It is extensively cultivated for horse and mule fodder, and thus frequently appears for cause stripped of its leaves for a height of thirty to forty feet. It then shows to advantage the brilliant contrast between its pale gray, almost white, trunk and the dark green of its crown. Plants with showy flowers were not numerous, and the flowers where occurring were not specially remarkable either for beauty or for fragrance. There were, however, one or two notable exceptions, which went far to redeem the reputation of the tropics. One of these was the tree known in the Maya language as *xkuichè*, which comprises the two species familiar to botanists as *Pachira alba* and *P. fastuosa*. Both forms were completely naked, except for the large tufts of red and white blossoms which were scattered over the branches. The tree is a favorite with the natives, and we met with it at numerous places along the open roadside; but its true home is the village garden. Scarcely less attractive in its display of flowers is the siricote (*Cordia Sebestana*), with its large and brilliant cups of scarlet, the abiding place of several species of humming-bird.

The picture of Merida and its surroundings, so far as the vegetation is concerned, is also the picture of much of the outlying region where settlements have effected a lodgment. The approach to every village is heralded by a growth of sabal or cocoanut, the former of which attains the dimensions approximately of the Florida palmetto, rising in graceful shafts sixty to eighty feet in height. Its most picturesque garb is seen when the tree is enclosed by the trunk and cable masses of the copó (*Ficus rubiginosa*), whose close embrace makes it appear as though the same trunk and roots were nourishing and supporting the lives of two very distinct organisms. The fig, of later growth, had wrapped its massive descending roots about the shaft of the palm, and in such a manner as to leave little or nothing of its fellow visible except the tufts of leaves. Manifestly the pseudo parasite had started life from above, possibly from seeds deposited by a bird, gathering sustenance from the atmosphere and its contained impurities. I could find neither here nor in Mexico proper, where I subsequently had frequent opportunity of observing this growth, evidence of strangulation of the host. Inasmuch as the trunk of the palmetto does not materially increase in bulk after it first rises from the ground, I doubt much if this closing around causes any real injury to the plant attacked, contrary to the general belief of the natives. The finest specimens of the cocoa palm were met with by us at a locality on the north coast known as the Serrito, a few miles to the east of the Puerto de Silam. The tree does not in this place grow to any great height, perhaps forty to fifty feet, but it appears

in full vigor, and many of the trees of the large grove, which is here bathed by the ocean breezes, were laden with fruits. Compared with the cocoa-palms which I subsequently met with in the Mexican region west and northwest of Vera Cruz, these appeared to be of a much more healthy type, and altogether their general aspect was much fresher. In the same region is also found the dwarf cocoanut (*Cocos coyol*)

In the mountain region forty to sixty miles south of Merida, or beyond Ticul, certain new elements are introduced into the vegetation, which impart to it a somewhat distinctive character, but, broadly speaking, the flora is still that of the northern limestone flats, with its acacias as the dominating feature. At several points on the northern flank of the Sierra, as between the hacienda of San Juan and Uxmal, and again between Ticul and the hacienda of Tabi, there are extensive growths of the red gum, the *chakah* of the Mayas (*Bursera gummifera*), the tree which yields much of the chewing gum of commerce. Like most of the larger foresters it was destitute of leaves, and in its peculiarly dichotomizing branches and copper-colored trunk, it could not fail to attract the attention of the traveler. The tree grows to a height of some forty to sixty feet, and in such close association as to form woods of its own. I met with it in considerable abundance along the line connecting Vera Cruz and Jalapa, not far from the village of San Juan. Along the roadways and in the thinner jungle the lesser pineapple or piñuela (*Bromelia pinguin*) was very abundant, its long and rigid saw-like leaves, tipped with bright crimson, forming an effective foreground to the more delicate types of vegetation beyond. Especially beautiful is the effect produced by these plants at the approaches to the famous ruins of Uxmal, great tufted masses, five to seven feet in height, line the roadway on either side—a natural stockade alike impassable to man and beast

Only along a comparatively short stretch of roadway between Izamal and Tunkas, on the Camino Real to Valladolid, did we meet with that phase of vegetable development which the mind popularly associates with a southern flora—a flora which is tropically luxuriant, and where luxuriance is dependent not upon the special growth of plants of a single order, but upon an assortment of largely heterogeneous elements. The beginnings of such a vegetation we found a few miles to the southeast of Sitilpech The limestone has here undergone deep decay, liberating a rich deposit of red earth, which has attracted a profuse and varied flora. The trees are very much larger than we had heretofore seen in the bush and some of them almost noble in their proportions. Manifestly they are the remains of a forest which was at one time far more majestic than it is to-day, and which dates its primal destruction probably to the period of the early colonization of the country by the Spaniards. The overarching boughs, decked with a profusion of dog-jessamine (*Tabernamontana amygdalifolia*), orchids and air plants, especially the latter, help to form a dainty bit of road scenery which it would be difficult to match Of the orchids, the *Cattleya* was especially abundant, forming by its large bunches great unsightly sears in the axils of the forest trees. We col-

locted also a number of *Oncidia*, etc. The epiphytes were mainly Tillandsias or Bromelias, which in places literally covered some of the large foresters, especially the *pich* (*Inga xilocarpa*). Among other components of the vegetation are the Spanish bayonet (*Yucca*) and Fourcroya, rising thirty to forty feet, and several species of cactus (*Cereus grandiflora*, *C. flagelliformis*, *Melocactus*). The first of these, the far famed night blooming Cereus, occurs in great sprawling masses, dependent from the lower branches of the bush. Here and there it is closely associated with the organ or giant cactus (*Cereus Peruviana*) and with other species to form dense and impenetrable thickets. Many of the plants were in flower at the time of our visit.

Three large cenotes, or, more properly, aguadas, those of Shkashek and Balantun, open up within a short distance of one another on this road, and their deep basins are largely encircled by a luxuriant growth of forest. Over the surface of two of these, great lily pads had encroached upon the water, recalling a picture from our own far north. In a second well a brake or cane, together with the *puh* (*Pandanus utilis*), had largely usurped the place of the lily. I observed here also a number of calabash bushes or trees (*Crescentia cujete*).

On the northern coast of the peninsula, adjoining the luxuriant *sapotales* of the Serrito, is a vast mangrove maze. Unlike the mangroves of the Southern United States, such as I had observed in profuse development on the western coast of Florida, or of Bermuda, the Yucatan mangrove is a noble forester, rising a hundred feet or more in height. The great air shoots or roots descend from an elevation of fifty to seventy five feet, and in their massiveness recall the giant cables of some of the *Ficaceæ*. In its general aspect the mangrove forest is most impressive—a wilderness of roots, stems and foliage, into which but little sunlight penetrates.

Attention has already been directed to the *scanty* character of the Yucatan sylva; this is, indeed, the nature of the "jungle," which is referred to by nearly all travelers since the days of Stephens and which encompasses the sites of many of the larger ruins of the interior. The true forest jungle, such as is to be met with in the State of Tabasco or in the low Mexican region west of the Gulf, is wanting over the greater part of the extensive limestone plain of the north, nor does it show itself in the mountain tracts either. This condition has led botanists to assume that the northern half of the peninsula was climatically and physically unsuited to the development of the profuse and healthy vegetation which elsewhere distinguishes tropical Spanish America. Indeed, Grisebach goes so far as to assume that the deficiency of forms is mainly due to an absence of rainfall, which is, however, as well marked in Yucatan as it is in most non mountainous tropical countries. The fallacy of this view has already been pointed out by Woeikof.* The scraps of luxuriant growth that appear here and there, taken in conjunction with the giant dimensions of some of the scattered foresters, seem to me to point rather to

* *Reise durch Yukatan und die südöstlichen Provinzen von Mexiko*, 1874. Petermann's *Mittheilungen*, 1879, p. 201.

favorable than to unfavorable conditions and to an explanation of the existing sparseness of the vegetation which has no connection with climatic or physical influences. I think it all but certain that an extensive forest at one time covered the land, and that successive devastations in one form or another have brought the surface to the condition in which we now find it. That the Spaniards here, as in Mexico proper, caused wanton destruction of the native forests is positive, but how often the destruction has been continued since the period of the conquest has not yet been determined.

The following brief notes on some of the plants observed by us may serve in a measure to elucidate the vegetation of northern Yucatan; most of the determinations have been made by Mr. MacKinney, who has also supplied the Maya names (the second name which occasionally appears in parentheses is the one in common use).

Cassia sp.? (*Yaxhabin*).—Tree, 15–20 feet, very abundant in the open scrub between the seaboard and Merida. Flowers bright yellow.

Acacia cornigera (*Subinche*).—Very abundant in the bush.

Acacia odoratissima? (*Baalche'*).

Inga alliocarpa (*Pich*).—One of the largest of the roadside trees, 70–100 feet or more in height. This tree appears to be specially selected for decoration by the Tillandsia.

Bombax ceiba (*Yaxché*).—The silk cotton tree is one of the giants of the Yucatan flora, of which it constitutes one of the distinctive features; 70–100 feet, very abundant. Specially noble examples of this tree, one of them measuring not less than eight feet in diameter, are found in the region about Ticul. Destitute of leaf at the time of our visit, but bearing an ample supply of pods.

Eriodendron anfractuosum (*Pochote*).—An abundant tree, mostly of smaller size than the ceiba, flowering.

Pachira alba, *Pachira fastuosa* (*Kuyché—Amapola*).—Cultivated as ornamental trees, 15–25 feet; flowering, but devoid of leaves.

Brosimum alicastrum (*Ox—Ramon*).—Very abundant in all the village gardens; cultivated for fodder. Tree, 60–80 feet.

Ficus grandifolia (*Akum*).—Large and abundant tree.

Ficus rubiginosa (*Copo*).—Very abundant as a pseudo-parasite on Sabal.

Ficus laurifolia.—Shade tree in the park of Merida.

Jacaratia Mexicana (*Kumché—Bonete*).—Large and abundant tree—in fruit. The conspicuous triangular fruit is prepared in a variety of ways as an article of food.

Carica papaya (*Put—Papaya*).—The papaw; very abundant in gardens.

Bursera gummifera (*Chacah*).—Tree (destitute of leaf at the time of our visit) very abundant in the hill region south of Ticul; 30–60 feet.

Spondias lutea (*Abal—Xkinin-hobo—Ciruela*).—One of the forms of Yucatan plum; extensively cultivated.

Spondias microcarpa (*Auc-abal*).

Spondias rubra (*Xhlo-abal*).

Cordia Sebestena (*Kopté—Siricote*).—Abundant in gardens.

Cedrela odorata (*Kuloché*).—Abundant in gardens in Merida and in nearly all villages.

Casuarina.—Abundant in gardens and in open places; 50–60 feet.

Anona squamosa (*Ɔalmui—Saramayo*).—The custard apple

Anona muricata (*Guanábana*)

Anona glabra (*Op*)

Sapota achras.—Much cultivated for its delicious fruit; tree 50–60 feet.

Lucuma mamosa (*Chacalhaa*).—The mamey.

Mamea Americana.—The San Domingo mamey, extensively cultivated.

Persea gratissima (*On—Aguacate*).—Alligator-pear.

Plumeria alba (*Nicté—Flor de Mayo*).—Cultivated for its beautiful and highly aromatic flowers.

Tabernaemontana amygdalifolia (*Ucupeh—Jasmin de perro*).—Dog-jassamine. Very abundant along some of the roadways, as on the Camino Real between Izamal and Tekantó, flowering

Crescentia cujete (*Luch—Jicara*).—Calabash tree; observed at the aguada of Sbkashek

Tecoma equinoctialis (*Sac ak—Bejuco de Chiquirito*).

Cucurbita pepo (*Kúm—Calabaza*).—Calabash.

Rhizophora mangle (*Tapché*).—Forming extensive forests on the north shore, east of the Puerto de Dilam.

Cereus Peruvianus (*Nun—Organo*).—The organ cactus, forming dense and almost impenetrable thickets, 20–30 feet. Very abundant near the hacienda of Tabi, southeast of Ticul. A smaller species is known as Nuntsutsul.

Cereus grandiflora (*Pitaya*).—Abundant in the thickets, where its great depending masses impede penetration.

Cereus flagelliformis (*Canchoh*).—Common on rocks.

Cereus lanatus (*Tsacám*)

Cactus opuntia (*Pakám*).—The common nopal.

Melocactus communis (*Polsakik—Biznaga*).—Abundant in places.

Bromelia pinguin (*Chom—Piñuela*).—Abundant, and forming dense thickets

Musa sapientia (*Sac-haas*).—The common banana; extensively cultivated.

Musa paradisiaca (*Box-haas*).—Plantain; also common

Cocos nucifera.—Abundantly cultivated, and forming along the northern shore beautiful groves; 50–70 feet.

Cocos coyol.—Dwarf cocoanut.

Sabal Mexicana (*Bayal-xaan*).—I am not certain that this is the common species of palmetto of Yucatan; the tree attains a height of some 70–80 feet.

Thrinax argentea (*Box-xaan*).

Thrinax parviflora (also *Bayal-xaan?*).

Pandanus candelabrum (*Cipil*).—Stray specimens appearing here and there in the bush, between Progreso and Merida.

Pandanus utilis (*Pah*).—In the waters of the cenote of Balantun.

Some Observations on the Bahamas and Jamaica.

By Dr. J. T. Rothrock.

(Read before the American Philosophical Society, November 6, 1891, as part of the Report of the Michaux Committee.)

The American Philosophical Society having last season set apart from the Michaux legacy the sum of three hundred dollars towards defraying the expenses of my West Indian exploring and collecting trip, I desire to offer the following

The object of the appropriation was the collecting of photographs and information which could be utilized in the preparation and delivery of the annual lectures, popularly known as "The Michaux Forestry Course."

Towards accomplishing this, the islands of New Providence, Eleuthera, San Salvador, Watling and Inagua, all of the Bahama group, were visited, as well also as Jamaica and its lesser political dependency, the Grand Cayman, which is situated one hundred and ninety nautical miles, nearly W.N.W., from the western end of Jamaica.

As the time allowed for my entire trip was but three months, it is evident that no prolonged stay could be made in any one place. We devoted by far the greater portion of our time to the island of Jamaica, and found everywhere, but especially on its greatest altitudes of 7000 feet, ample returns for our search

In all, about one hundred and fifty good negatives were obtained As duplicates were usually made, it is fair to say there are about seventy five satisfactory illustrations of trees, physical geography and topography of the islands visited.

How rich a field the island of Jamaica offers may readily be inferred from the following facts:

1 If reduced to a square, the island would be about sixty-five miles long by as many wide.

2. Its population is only about 600,000 souls.

3. Only twenty-five per cent. of its area is under cultivation

4. The agricultural methods are very primitive and fertilizers are sparingly used.

5. Notwithstanding these facts, this small area, after retaining enough for home uses, sends into the markets of the world nearly $9,000,000 worth of products each year. These are mainly from the vegetable kingdom.

It is well, also, to call attention to the fact that, of these exports, probably about fifty per cent. are shipped to the United States as against thirty-seven per cent. to Great Britain. Of fruit alone, we received in 1889 not less than $1,580,000 worth, as rated by the exports there. Of course, its value here was vastly greater. There has been during the past five years a *decided increase* in the trade with the United States, and *some also* with Canada.

In spite of the relative proximity of the Bahamas and Jamaica, the contrast between these islands is exceedingly marked. The Bahamas are low and show no considerable elevations. Jamaica reaches a maximum altitude of 7360 feet above the sea level. The soil of the Bahamas is scanty, and consequently cultivation entails fertilization. That of Jamaica is of great depth, and its continued productiveness is evidence of a vast natural fertility. The flora of the Bahamas shows marked resemblance to that of Florida. The flora of Jamaica is essentially tropical, save at such altitudes as suit plants of cooler regions. In such places we found the common chickweed (*Stellaria media*), the white clover (*Trifolium repens*), associated with plants from the cooler parts of southern regions.

The mangrove (*Rhizophora mangle*), common to the tropical seas around the globe, attains in Jamaica (compared with that in Florida and in the Bahamas) a surprising height. Near Port Morant are large jungles, where the trees attain a height of at least sixty feet. This is the proper place to call attention to possible tannin production, which the mangrove suggests. No tree that we have here, at all approaches it in the percentage of tannin it contains. That the mangrove should have remained so long unutilized is due to the difficulty of obtaining its tannin free from coloring matter. There is this to be said, however, that in the near future, owing to exhaustion of other tannin producing trees, the arts will be forced to draw upon the mangrove, even if an improved chemistry is not able to free it from this objectionable color. The natives obtain a red brown dye from the bark by simply steeping it in water.

When one remembers that the aboriginal population of Jamaica must have depended largely upon the indigenous vegetable products for food, it is surprising to observe to what an extent these have been supplanted by fruit and food from introduced plants. For example, the mango, bread-fruit, cocoanut, bananas, and likely also the yam. Even the logwood, now so important to Jamaica, has been introduced there.

Of the original forest but little remains in Jamaica, though reproduction has again covered the steeper slopes with a luxuriant growth of timber.

Jamaica is not wanting in hard woods. Some of these are of great value. It is claimed that of these they need none from us. Though, on the other hand, it is equally sure that for white and yellow pine the island draws very largely upon our resources. The United States furnished Jamaica in 1889 nearly $400,000 worth of building material, of which the major part was probably lumber. It is not probable that the economic resources of the vegetable kingdom in Jamaica are properly recognized, or that we derive from them now anything like what we shall in the future.

Attention should also here be called to the fact that, years ago, attempts were made to introduce the Sisal hemp from Yucatan into the islands on the southern coast of Florida. It appears to have been abandoned (probably from want of proper machinery to extricate the fibre). The plants are now growing wild in these Florida islands, and have been

introduced, under the intelligent and earnest direction of Gov Sir Ambrose Shea, into the Bahamas, where they promise soon to furnish large quantities of fibre which will rival manila in the markets of the world

From Publication No 86, of the U S. Hydrographic Office for the Year 1888, page 1, I quote the following "The sea breeze generally sets in about 9 A.M., and, blowing either directly on shore, or, according to the trend of the coast line, at an angle to it, continues till about sunset, when a calm interval is succeeded by a light off-shore air, attaining its greatest strength about day dawn, and being succeeded by an oppressive calm, to be again followed by the sea breeze. On the coasts of Cuba, Santo Domingo, Puerto Rico and Jamaica, the regular sequence of land and sea breezes is seldom interrupted." So far as our observation could go in so brief a period, we can entirely confirm this general statement These local breezes must not, however, be confounded with the trade winds which, from latitude 28° N., come normally from the N E or E N E and sweep over the ocean areas in which these islands lie. Neither must we lose sight of the fact that, at Kingston, in Jamaica, the wind comes the year through almost constantly from the S E.

Observation has shown that during the months of November, December and January frequent rains fall upon the northern side of the island of Jamaica. It would appear as if the direction of these trade winds and the position of the island of Cuba might explain some notable differences in the distribution of this winter rain upon the northern shore of Jamaica From Cape Maysi, on the eastern end of Cuba, to Morant Point, the eastern end of Jamaica, the direction is N E ½ N or about N 39° E The distance is about 180 nautical miles. Port Antonio bears by the compass from Cape Maysi about 8° more to the westward than Morant Point. Both of these places are, however, fairly in the line of the N E trade winds, which may reach them without sweeping over the mountainous, fog-enveloped eastern end of Cuba. It is important to bear in mind that these mountains on the eastern end of Cuba attain a height of 7000 feet and must have a temperature considerably below that of the sea level A line drawn from Lucea, on the northwestern end of Jamaica, would cut the mountains of Cuba about 100 miles from the eastern end In other words, the trade winds from the N E., to strike Lucea, must first cross the mountains of Cuba, where, by the lower temperature, the moisture is precipitated. Whereas, the normal N E trade wind can reach Port Antonio without having to cross the Cuban mountains. The latter reach the Jamaica coast as wet winds, whose moisture is precipitated on the northern side of Eastern Jamaica, but the winds which reach Lucea come as dry winds.

The facts, as observed by us, were, first, the large aqueous precipitation of Port Antonio and the small precipitation at Lucea. The whole fact is briefly expressed by the saying of the sailors, that to find Port Antonio you had but to enter the blackest, rainiest port on the northern side of Jamaica.

The practical bearing of this is not hard to see from a sanitary standpoint. The high ground on the western end of Jamaica is the climate most suitable for the invalid. The beautiful little town of Lucea, if it possessed a large, well kept hotel, would be an ideal winter resort for our northern invalids.

Whether considered from the standpoint of climate, scenery or productiveness, Lucea could be made a more desirable winter resort than the Bahamas. Indeed, I am so strongly impressed by the possibilities of Northwestern Jamaica for the invalids of the future that I cannot refrain from making these statements as positive as I have.

There is one more factor to be considered in the climate of Lucea. It is that the trade winds from the N. E. tend, on striking the northern coast of Jamaica, to be deflected into E. N. E. winds. This would place Lucea somewhat under the protection of the parishes to the east of it, so far, at least, as the rainfall is concerned.

We lay in the harbor of Port Morant, on the southern side of Jamaica, whilst a furious north wind was blowing on the northern side of Jamaica and deluging the region near Port Antonio with the rainfall. Yet we received a very moderate share of the rain, which was drained from the clouds by the mountains north of us.

Dr. Morris read a note from Mr. Patterson, Trustee under the will of the late Franklin Peale, suggesting the removal of the stone-age collection of relics, and moved that the Curators be instructed and authorized to withdraw from the custody of the Academy of Natural Sciences the Peale stone-age collections.

A discussion ensued, in which Dr. Brinton, Dr. Morris, Dr. Cope, Mr. Dudley, Mr. Martindale and Mr. Du Bois took part.

The President stated the manner in which the Society had become the owner of the collection referred to.

On motion of Mr. Dudley, the further consideration of the whole matter was postponed until the next regular meeting of the Society, and the Curators were requested in the meantime to examine into the facts and report upon the same.

At the call of deferred business, the report from the Committee of which Prof. E. D. Cope was Chairman, postponed from May 1, 1891, was taken up and considered.

Prof. Cope requested that the same might be postponed until next meeting, which, on motion, was agreed to.

And the Society was adjourned by the President.

Stated Meeting, November 20, 1891.

Present, 26 members.

President, Mr FRALEY, in the Chair.

On motion of Mr Dudley, it was

Resolved, nem. con., That the ordinary business of the Society should be suspended, and that such matters as were set for this evening should be postponed until the next regular meeting, and that the only business that should be attended to to night, should be the reading of a paper by Mr. Henry C Baird, on "Carey and Two of His Recent Critics—Bœhm-Bawerk and Marshall," and the presentation of the portrait of Mrs. Seiler

Mr. Henry Carey Baird read a paper on "Carey and His Recent Critics."

Mr. Rosengarten read the following letter

FREDERICK FRALEY, ESQ.,

President American Philosophical Society

DEAR SIR —Some of the friends of the late Mrs. Emma Seiler, including many of her pupils, desire to present to the Philosophical Society, of which Mrs. Seiler was a member, a marble relief portrait of that lady, to be placed in your Hall, as a memorial of her scientific labors and of her success in elevating musical education, and of her contributions to a better knowledge of the voice in speaking and singing. You are respectfully asked to request the Philosophical Society at its next meeting to accept this gift, and to fix a time when it can be presented, and a memoir of Mrs. Seiler, be read, to be preserved and printed in the record of the Transactions of the Society

We are very respectfully, etc.,

Mrs. Caspar Wister,
Mrs. Brinton Coxe,
Miss Rosengarten,
Miss Bradford,
Miss Maria Hopper,
Mrs. Meschert,
Miss Meschert,
Miss Bennett,
Miss Eliza B Chase,
Mrs. Agnes O. E. Shipley,
Mr William Ellis Scull,
Mr. M H Meschert,
Mr. Charles Platt,
Mrs S I Lesley,
Mrs Mairiott C Smythe,
Miss Maria Moss,
Mrs John W. Field,
Miss Ella C White,
Miss Mary A Burnham,
Miss Kate S Gillespie,
Miss B M Randolph,
Mrs. George McClellan,
Rev. Dr T. K Conrad,
Mr William Platt Pepper,
Mr Edward H. Coates,
Mr J G. Rosengarten.

Philadelphia, November 4, 1891.

Mr Rosengarten, presenting the portrait of Mrs. Seiler, spoke as follows:

MR. PRESIDENT:—At the last meeting, the American Philosophical Society agreed to accept a marble relief portrait of the late Madame Seiler, presented by a few of her friends and pupils. I now have the pleasure, on behalf of the subscribers, to present it to you and through you to the Society. Madame Seiler was a member of this Society, one of the six women who have thus far been enrolled on its list. The others were Princess Dashkoff, Mrs. Somerville, Mrs. Agassiz, Miss Maria Mitchell and Miss Helen Abbott. Her works on "The Voice in Singing" and "The Voice in Speaking" were not her only claims to this distinction. In Germany, her native country, Madame Seiler was a pupil of the famous teachers of the University of Berlin, and it is to her that is attributed the first use of the laryngoscope in studying the organs of the throat, while her discovery and description of some of the parts of the throat were of great value. She brought letters of introduction from well known German savans to the late Dr George B. Wood, for many years President of this Society, and through him was enabled to make the acquaintance of the Rev Dr Furness, among its oldest members. This venerable member of the Philosophical Society helped her in all of her literary work, and was her kind and steadfast friend through all her life; his last act of kindness was officiating at her funeral, when his tender sympathy and earnest words assuaged the grief of her family and her friends. But no patronage and no help would have availed without the talent, energy and ability which won for Madame Seiler hosts of friends here. Her success was shown in the establishment of a singing academy, where many pupils were trained in her methods, and her little leisure was spent in scientific and literary work. Much still remains in manuscript, but her printed books have been freely used and commended by the later writers on the subjects specially her own. As a mark of respect and affection, her friends and pupils have secured this admirable marble relief portrait. It is the work of Mr Henry K Bush Brown, a young American artist, and it is now presented to the Philosophical Society, with the request that it may find a suitable place on the walls of its hall, where there are portraits and busts of many of the distinguished men who have been members. What Madame Seiler did to entitle her to this honor will be set forth in detail in a biographical sketch to be read this evening, and that memoir will no doubt be preserved in the growing list of necrological notices in the printed papers of the Society. On behalf of the subscribers this marble relief portrait is presented to the Society as an expression of the affection and admiration felt for Madame Seiler in her lifetime and in the hope of thus perpetuating her name and memory as those of a woman who did much for a scientific knowledge of music and whose general culture, broad sympathies and earnest labors endeared her to all who knew her. Coming to this city almost an entire stranger—not even a master of

the language spoken here—it was the kindness shown to her by members of the Philosophical Society that enabled her to find employment and to show her mastery of her art and to carry on her scientific work and to write her books. It is eminently fitting, therefore, that this memorial portrait should find its final resting place on the walls of your hall, and that her name and services should be perpetuated in your records. I now, in the name and on behalf of the subscribers, hand over to you and through you to the keeping of the Society, the portrait of Madame Seiler, a member of the Society, a woman of many virtues and talents and beloved by a large circle of friends, who have joined in thus testifying their sense of the honor conferred on her by this Society and of her eminent right to it.

The President accepted the portrait in a few appropriate remarks.

Mrs. J. P. Lesley then read the following sketch of Madame Seiler:

Mrs. Emma Seiler was born on the 23d of February, 1821, at Wurtzberg, in the kingdom of Bavaria. Her maiden name was Diruff, and her father was court physician to Ludwig, King of Bavaria, and also Surgeon-General to the kingdom. Emma Diruff had two brothers and two sisters. One of her sisters afterwards married Dr Canstadt, a celebrated physician and professor at Jena, who also started a medical journal, which is still in existence. Her other sister married Dr Demme, professor of surgery at Berne, and brother of a distinguished Lutheran clergyman of that name, formerly settled in Philadelphia.

The children of Dr. Diruff were on familiar terms with the young princes and princesses at the court of King Ludwig, and occasionally shared their lessons with the same tutors and professors, and Emma grew up in close intimacy and friendship with the princesses, and with the young Maximilian, and Otto, King of Greece. She lived in the atmosphere of court life, was early presented, and the king and queen valued highly their intercourse with the family of the court physician. To our American ideas these are trifles, but unless we understand all the early influences of a young life, we cannot realize what one must have to overcome in later years when living among people to whom all such distinctions are purely artificial.

Her early youth was a very happy one, devoted to her education, in the heart of a family circle of sufficient wealth to be free from serious anxieties and cares, and their home in the midst of beautiful scenery, for which she had all her life a deep appreciation.

In the year 1841 Emma Diruff was married to Dr Seiler, a young physician whose family like her own was one of the oldest and most aristocratic in Bavaria. The estate of her husband, to which she at once removed with him, was situated in Langenthal in Switzerland, not far from

Berne She was then twenty years old For some years she lived in outward comfort, not called on for serious exertions beyond the cares for her children and the guidance of her family affairs. But in 1846 some speculations in which her husband had engaged failed, all his property except the estate on which they lived was lost, and from this time forth she lived a life of deep and constant anxiety, and under the necessity for unremitting exertion. They both thought that their home on the estate might be made remunerative by turning it into a private asylum for insane patients, and into this work Mrs. Seiler threw herself with the energy and ardor of her nature, making herself the sympathetic friend of those whose mental maladies were of the milder type, and having great influence over the violent. At one time, after watching successfully for some months a case of suicidal mania, the patient escaped her and was found to have hung herself Mrs. Seiler, after an hour of heroic effort, succeeded in restoring the life that was apparently extinct. At another time, she was badly injured by lifting an insane woman, and carried that injury and the suffering it occasioned to her dying day But she was never one to dwell upon personal sorrows and pains, or talk about them; nor could she help away her griefs by personal resentment, a poor way for any of us to be helped. But she went on courageously with the work appointed to her, only finding her eyes and her heart more open and sympathetic with her sufferers, and her hands more active

In the year 1847 a famine came upon Switzerland, not due to failure of crops, but to political causes. The French invaded Switzerland in preparation for the Franco Austrian War, blockaded all the outlets, and the price of provisions became so high that the very poor had no means to supply their wants At Langenthal and in many other places, they fell dead in the streets from starvation Mrs Seiler's heart ached well nigh to bursting with the miseries she saw around her—the dead and dying in the streets, the wretchedness of those who survived Night and day she pondered on their distresses and thought over plans for their relief But all her plans required money and she had none One night in her agony she prayed, "Oh, my God, send me power to help my poor dying people! Oh, my God, show me the way!" "I prayed all night upon my knees," she said, "and by daylight my mind was clear"

She rose early, and having attended to her family and her patients, she went to the clergyman of the village, to ask for his sympathy and approval When she had finished an ardent appeal to him, he said to her in a deep and solemn tone which she was fond of imitating, "Read the Bible to those dying people" And when she said, "But they are starving to death, they must have food," he only repeated mechanically, "Read the Bible to those dying people, every one." When she declined to do this, and rose impatiently to go, he said, in the same sepulchral tone, "When that great day comes when the Judge shall separate the sheep from the goats, where will *you* be?" "That does not concern me at all," said Mrs. Seiler, "whether I shall go with sheeps or goats. I was thinking of some-

thing very different. But you, sir, how shall it be with you in that day? Will you go to sheepe or goats?" There was no answer to this question, and she hurried away to carry out her vision of the night without the aid of the clergyman. "I walked to every comfortable house that I could reach on foot," she said, "and besought them to give me whatever they could spare in food or money" Her eloquence brought a generous response Then she went through the wretched streets, and invited three hundred to come to her house the next day She bought materials, and herself prepared large kettles of nourishing broth, and bought huge loaves of bread. Then she lodged and fed them through the day on her own premises. Many lives were saved by this timely aid, but this was but one part of Mrs. Seller's midnight planning As soon as the poor lives were enough restored for work she induced them to learn some little handicraft by which to help themselves. She herself understood all the beautiful methods of embroidery and exquisite darning and crocheting, and to these she added braiding of hats and baskets and mats, that she might teach them The hands so awkward and unskillful at first, soon became expert under her instruction, and even very little children in the end did exquisite work. And now she had a real manufactory of salable articles. Then she sent to many rich persons at a greater distance to come and see "I was a very handsome woman then" she said with naive simplicity, "and I thought to myself, I will now make my beauty of some use So I did send to all my courtiers [she meant admirers] to come and see me, and I made it very agreeable for them, and they did buy all my poor people's work, and that did give me much money, to take in and feed and teach more starving people, and then many young ladies of fine families came to me and said, 'Mrs Seller, we will learn all your arts, and then we will come and help you to teach the poor people,' and they did. And so the circle of blessing was extended "*

I cannot close this little history of one brief period of Mrs. Seller's life without telling you that her methods in this time of her country's needs were so successful and far reaching that the Swiss government and afterwards the Swedish and Danish governments sent emissaries to see them, and so convinced were they of their goodness and practicability that they copied them in their own administration

Her versatility and energy and physical strength were at this time very great, and her resources unfailing. During the whole period of the famine she had to plan carefully and keep the strictest account of expenses and also arrange new plans to replenish an ever-lessening treasury So, while teaching the handicrafts, she set about discovering the fine natural voices which she knew must exist among the poor peasants who flocked daily to her estate. Having found fifty or more capable of it, she devoted

* Mrs. Seiler's daughter writes me "When I was in Germany, I made it a point to ask my mother's brother and sister as well as old friends about her youth, and all agreed that she was not only the handsomest girl in Wurtzburg, and called 'The Rose of Wurtzburg,' but was also beloved by all who knew her"

herself with ardor to the training of a band of choristers, who in time sang the most beautiful music all over the neighborhood; she gave lovely concerts, and the proceeds enabled her to carry on her pious charity a much longer time

Much of all this I learned from her own lips, told so incidentally and naturally, one could see that she did not herself appreciate its admirable character But it was strikingly confirmed to me by a lady from this city who with her husband traveled through that region only a few years ago In the mountains she met a peasant whom she asked if he had ever known a Mrs Emma Seiler who once lived there. His face brightened all over as he assured her that he remembered her well, and then he told with enthusiasm the story of her saving the lives of so many of his comrades and the good she had done in many ways to all the people

Late in August of 1851, the home at Langenthal was broken up, the private asylum came to an end, and Mrs Seiler found it necessary to support herself and her children by her talent for music, and she left Switzerland never to return to it as a home.

She went first to Dresden, and there took lessons of Wiek, the father of Clara Schumann, with whom she became intimate. She supported herself and her children by giving piano lessons while she was cultivating her voice. But while in training there she lost her voice, a bitter disappointment to her, because she could earn much more by teaching vocal than instrumental music. She remained in Dresden three years, during which time her house was the rendezvous of the principal musical celebrities. She worked hard at her piano lessons, but she did not recover her voice Then she went to her sister Mrs. Canstadt at Breslau and passed a year giving lessons, and then to Heidelberg Here she found piano lessons poorly paid, every one wanted singing, and this inspired her to study with zeal the laws of vocal physiology, and the causes of the overstrain which had destroyed her own voice and that of so many others. Here at Heidelberg she became intimate with the two Bunsens, the chemist and the statesman, and also with Kirchoff, professor of physics. Bunsen the chemist and Kirchoff together discovered the spectroscope while she was there, which excited all her enthusiasm.

In December, 1856, she met Helmholtz, who was made professor extraordinary of music. He was then engaged in writing his great work on "Sensation in Sound," and went to Mrs. Seiler almost daily for several months for advice and for verification of his calculations by her experiments After living in Heidelberg nearly six years she went in 1856 to Leipsic to study herself, and to give her children a musical education at the conservatory Here she knew well Moschelles, Dryshock, and David the violinist, and also the professor of physiology Ernest Heinrich Weber, and with his aid she studied the anatomy and physiology of the voice and published her first book "Old and New in the Art of Singing," which created a profound sensation in musical circles. From Leipsic she went to Berlin. By the care and training she had given herself after she

had discovered the cause of her trouble she recovered her voice, and was now once more able to give lessons in singing. She had the first laryngoscope, invented by Manuel Garcia, constructed after her own directions, and by it she discovered the verification of her theories with regard to the head notes of the female voice. In Berlin too she found herself in a delightful society, meeting often Du Bois Reymond, the egyptologist Lepsius and many other distinguished companions.

In 1866, finding her means of earning a livelihood almost at an end through the straightened means of the German people during the war, which did not permit many to indulge in the luxury of music, she left Germany and came to Philadelphia. Every movement of her life seems to have been made under the stress of stern necessity. She loved a permanent home, but she accepted these changes, the parting from old friends, the barriers of language, the unaccustomed ways of a new world, with the same sweet patience and simplicity that characterized her life.

I am not competent to speak of her musical career in this city and must leave it to abler minds to do it justice. She brought letters from wise and good men in Europe which at once placed her cause in the best hands. The extracts from the valuable sketches of Charlotte Mulligan and Harriet Hare McClellan, former pupils and friends, which follow my imperfect record, will supply the information I cannot give. From Dr. Furness she had the highest service that devoted friendship could give, since he gave time and personal labor and much care in translating her manuscripts into exquisite English. Her work on "The Voice in Singing" is entirely her own. In the "Voice in Speaking" she had much assistance from her son, Dr. Carl Seiler, in the physiological parts. In establishing her school of vocal music she had the personal assistance and generous backing of many devoted friends.

I may mention here that within two years of her residence in Philadelphia Mrs. Seiler was made a member of the American Philosophical Society, an honor accorded to but six women since its foundation: the Princess Catherine Romanowa d'Aschkow, Mrs. Somerville, Miss Maria Mitchell, Mrs. Emma Seiler, Mrs. Louis Agassiz and Miss Helen Abbot.

I have heard that she was not a good business woman, and I can well believe it. No one has all the gifts. Her monumental work consists in the voices she trained, and in the noble principles of art she inculcated. I am told that the principal strength of her teaching lay in cultivating purity of tone and truthfulness of expression.

Those who think that she overdid the value of technique, would do well to read her fine chapter on "The Æsthetic View" in "The Voice in Singing." It was one of her strongest and deepest principles, differing greatly from some modern ideas, that art and genius cannot do the best if divorced from morality. So she despised Wagner's music, and would say indignantly, "He is a man of immoral life; we must not allow that the music of the future can be furnished from such a source." As one of her dear friends said of her to me, "No, Mrs. Seiler could never believe

that a bitter spring could bring forth sweet waters. It was the same with her innocent pure mind in all art," said this same discerning friend. "She could walk about a room full of nude figures with real enjoyment of the exquisite outlines, but let her see a fully veiled figure whose attitude or expression denoted meanness or low tastes and a shudder went through her."

I had not a close intimacy with Mrs. Seiler, she was too much occupied for me to have been willing to take up much of her time; but those who knew her better can easily fill out and correct the only portrait of her that my warm personal friendship allows. She came at intervals an uninvited but most welcome guest to take tea and pass the evening with us, those evenings will never be forgotten.

Her conversation had a rare charm, and was by no means confined to those subjects she would have been supposed to be most interested in. She had an appreciative interest in what each friend had most at heart. The young artist in painting was surprised to encounter in her such sympathy with the humblest efforts, and was charmed with her accounts of the various schools of art in the Old World, and her stories of wonderful paintings and their effects. The scholar and the student found her a delighted and receptive listener to his researches in Archæology or Egyptology, and her personal stories of distinguished scholars whom she had known intimately in Europe lighted up the moments she gave them. Often most amusing in its dramatic characterization of persons and events her conversation was always kindly and could not wound. I must make one exception. There were occasions where she was carried out of herself by her indignation at what she knew or believed to be wickedness. But these occasions were rare. She had in the main a sweet and patient temper as surely as she had a warm and loving heart and a sunny spirit. One remembers far oftener the delicious humor, the innocent childlike mirthfulness with which she would tell of her own adventures and escapades. I recall how, after her first visit to Europe, after she had made a home among us, she came to spend an evening with us, and the glee with which she told us one little incident of her travels. She was in Italy, and I think on the train between Rome and Naples, when some ladies who were attracted by something she said about music to her companion joined in the conversation. In the course of it they mentioned that the Italian government had directed that the works of Mrs. Emma Seiler on the "Voice" (an American lady they called her) should be introduced into all the schools. Do you know her, they asked? She looked reflective. "Yes, I do know that woman quite well indeed," said Mrs. Seiler, "she is a good woman and she knows quite well about the voice, she has studied it long. Ladies, your gouvairnment [so she pronounced it] has done a very good thing indeed to direct that the books of Mrs. Seiler shall be taught in the schools. I will myself tell her just so soon as I return to America." And she bade them farewell without disclosing her identity.

There is no doubt that she was impulsive and impetuous; those qualities could not have existed apart from the divine energy that accomplished such results. The sources of our virtues are also the sources of our faults. Let it be said that she was sometimes undisciplined in speech, and sometimes misunderstood her friends. We will remember that she came to us Puritans, Quakers, self restrained people, from a demonstrative and enthusiastic nation of Europe, and that we are quite as likely to have misunderstood her. Let us remember, too, the constant strain and stress of her hard-working life in a profession of all others trying to nerves and spirits. And if she demanded much of others she was harder on herself. After toilsome days she often studied into the small hours of the night to keep herself at the high-water mark of knowledge which she conscientiously exacted of herself.

In 1883 her children induced her to give up a life of such incessant exertion, to close her school of vocal art, to take a trip to Europe for relaxation, and on her return to take only private pupils. Her visit to Europe at this time illuminated the remaining years of her life, everywhere she met with warm friendship and cordial admiration. When she returned, it was to a peaceful home, where loved children and grandchildren could often come to see her, where she received pupils through the day, and lived alone with one faithful, loving German servant to whom she was both friend and mother. It was a quiet, retired but peaceful life. She had always been simple and unworldly, full of humanity and taking delight in small pleasures, such as lie within the reach of all. The companion of princes, the friend of the first statesmen and philosophers, poets and musicians of Europe, the beloved of Clara Schumann and our own Anna Jackson, found joy in making one poor German girl happy and in being made happy by her. "We go to the Park in the hot summer days, Paulina and I; we sit down by the water, and under the trees and hear the birds sing, we look at the children on the flying horses and we visit the Zoo. In the winter if we are tired or lonesome Paulina and I will go to the opera. Sometimes we do go to see Buffalo Bill, and we laugh and shake all over, and that rests us."

Mrs. Seiler left us on the morning of December 21, 1886, at two o'clock. She had been ill for nearly two weeks, but few persons had known of it, and it was a surprise to nearly every one. She had often said she hoped she might not live beyond the age of sixty-five, and her wish was granted. Her disease was spinal meningitis, and she was unconscious from the beginning of her illness to its close. For her we could ask nothing better. She escaped the languors and disabilities of old age, she never tasted death. At the brief funeral service, I longed to hear some voices of those who had loved her and whom she had trained sing the beautiful hymn, "Oh Spirit freed from Earth."

After her hard-working, self denying life, crowded with services to her fellow-men, and faithful to the end, she has entered into immortality. For, what Dr. Furness said of her in beautiful words (which I must not

try to quote accurately, but I am sure I caught his idea) is the great truth What she thought or believed about immortality is of less consequence, than that she lived a life which must keep the soul near to God, here and hereafter.

EXTRACTS FROM A BIOGRAPHICAL SKETCH OF MADAME EMMA SEILER, BY CHARLOTTE MULLIGAN

"The death of Madame Seiler, which occurred in Philadelphia recently, deprives the world of one of the most remarkable women of the century Every teacher of the voice in America, every student who has made a specialty of the throat and vocal apparatus, knows the value of Madame Seiler's discoveries and her books upon these subjects are the standard authority 'Not one of us has improved upon her work, with all our efforts,' said Dr Lennox Browne to us, three years ago, in London, 'and she stands still the peer of the greatest of us all' In this testimony hundreds of other physicians would agree, and the world of science has long known the importance of her researches, and accorded her an honorable position among its savans. Garcia was the discoverer of the laryngoscope, but Madame Seiler applied it, and followed out a course of study that, when presented to the world, greatly facilitated the efforts of those who were endeavoring to understand the vocal action 'The greatest living authority upon the voice,' Garcia himself, styled her his friend and colaborer, and the encomium was rightly hers.

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"During her early life Madame Seiler became deeply interested in the study of medicine, her father being at that time physician to the court of Bavaria. It was considered almost a sin in that age for a woman to learn anything about the structure of the human frame, and every tendency towards the acquisition of such knowledge was promptly checked These restrictions greatly hampered the young girl, but she found opportunity to read books from her father's library, and before her marriage had acquired an extensive knowledge The voice appears always to have interested her particularly, and she was first attracted to the subject by the song of a pet bird Her own description of the way in which she arranged to see the throat of a human being after death, illustrates the persistency with which she prosecuted her studies Going to spend some time with an aunt, she made friends with a medical student in the town, and to him confided her desire. He, at the risk of being discovered, procured a throat and took it to the house late one night, when the old aunt had retired 'Two weeks we worked together,' she said, 'examining the muscles, dissecting them with the greatest care and studying every detail' This study was always done at night, but the time Madame Seiler counted as most precious to her, for it developed her understanding of a subject that was of the greatest importance, yet not at all familiar even to professional men. For several weeks after this experience her work

was constantly interrupted, and she struggled with many bitter trials. Her mind was not inactive, however, and she formed theories then that later on she demonstrated to be facts. Acoustics to her became a science that offered the greatest possible interest, and she studied the inflections in the cries in birds and beasts until they became a perfect language to her Falling water, the different sounds in the atmosphere, and the myriad tones from the insect world, all had for her their harmonies or lacked the essentials of perfect tones. She heard in nature what is shut off from ears that are duller than hers, and she lived in a world upon the border of which we can only stand. The human voice, according to Madame Seiler's view, had never yet been developed to accomplish even half of which it was capable. Some of her theories were exemplified in her own case, and up to the last year of her life, she could produce superb tones, that rang and vibrated with wonderful power and beauty The production of such tones required constant work, but once they were acquired they were well worth the labor and discouragement that attended the study We have never yet heard a pupil, who had studied with this famous woman, who did not show either in the speaking or singing voice, some of the remarkable qualities that she knew the voice could be made to possess. One of these was richness of tone, a peculiar concentration that demanded attention, and an effect of power combined with sweetness. Madame Seiler possessed it to a remarkable degree, and imparted it to all those who had the intelligence to study with confidence in her great ability The voice in speech was second only to the voice in song, and she laid great stress upon the care that young children should have when they are beginning to discriminate between sound and noise. No great singer ever came directly from Madame Seiler's care, because she paid most attention to those qualities which tend to make a voice retain its beauty and freshness. When those were acquired, then the accessories were undertaken, but many a pupil tired of the preparation, and other masters built upon her enduring foundation, reaping a glory that never could have been theirs but for her conscientious work Madame Seiler was also a woman who had lived all her early life among scientific men in Europe who appreciated her mind and made much of her Her life in this country was one of comparative isolation She could not understand the lack of reverence and respect with which she came in contact, especially in younger people, and she sought her chief happiness among her books. The end came peacefully, and the bright, gifted woman fell quietly asleep. Her death falls heavily upon many throughout the country, for she had been a great benefactor to hundreds, who, through her instrumentality, have learned the true use of the voice. It is difficult to believe that her work is completed, to realize that all is over, that she is removed forever from this world. As one of the many who knew her value, who appreciated her true nature and wonderful knowledge, we pay a parting tribute as friend and pupil."

EXTRACTS FROM A BIOGRAPHICAL SKETCH OF MADAME SEILER, BY HARRIET HARE McCLELLAN.

"In passing from the highest tones of the falsetto register, still higher to the head tones, she was the first to observe a change in the motions of the organ of singing, which she discovered to be due to a sudden closing together of the vocal ligaments to their middle, 'with their fine edges one over the other, leaving free only a third part of the whole glottis immediately under the epiglottis, to the front wall of the larynx.' The foremost part of the glottis formed an oval orifice which with each higher tone seemed to contract more and more, and so became smaller and rounder. It was objected to this result of her observation that such a contraction of the glottis was only possible by means of 'cartilages and muscles,' but that such cartilages and muscles as could render an action of that kind possible were not known. Madame Seiler fully admitted the soundness of this objection, while she was, after repeated trials, more and more convinced of the correctness of her own observation, so she began anew to study the anatomy of the larynx in dissected subjects and was rewarded by finding within the membranes of the vocal ligaments certain fibres of muscle which she called the aryteno-thyroid interna, and which have also been found by other observers. They consist of muscular fibres, sometimes finer, sometimes thicker, and are often described in recent works on laryngoscopy as continuations or parts of one of the principal muscles of the larynx, but her chief discovery was of certain small cuniform cartilages within the membranes of the vocal ligaments, and reaching from their junction with the arytenoid cartilages to the middle of the ligaments. She states that she found these always in the female larynx, and that they undeniably work the shutting part of the glottis, but as they are only now and then fully formed in the male larynx, it follows plainly that only a few male voices are capable of producing the head tones. She adds that observation in the microscope revealed in those larynxes in which the cuniform cartilages were wanting, parts of a cartilaginous mass or the rudiments of a cartilage in the place indicated, and accounts for the cartilages not having been discovered earlier, by the fact that the male larynx was most commonly used by anatomists for investigation, as its muscles are more powerful and its cartilages firmer than in the female larynx

"Thus she proved her point, and better still she succeeded, by patient effort and persevering practice, of which she was unsparing now that she had discovered the cause of her inability to sing [the attempt to carry upward the throat tones beyond their proper limit] in once more recovering her voice. Certainly if proof were demanded of the truth of her theory, or the practical value of her method, it need be sought no further than in the fact of her having succeeded so completely in the restoration of her own voice, a task recognized by all singing teachers as infinitely more difficult than the original training of an untried organ. At last she who understood the art of singing could sing again—and a glad song she sang!

"She has spoken for herself as to this portion of her experience and it seems most appropriate to quote her own words.

"'As I had had for many years the best teaching, both German and Italian, in the art of singing, and had often sung with favor in concerts, I was led to believe myself qualified to become a teacher of this art, but I had hardly undertaken the office before I felt that while I was able to teach my pupils to execute pieces of music with tolerable accuracy and with the appropriate expression, I was wanting in the knowledge of any sure starting point, any sound principle from which to proceed in the special culture of any individual voice. In order to obtain the knowledge which thus appeared to be requisite in a teacher of vocal music, I examined the best schools of singing, and when I learned nothing from them that I did not already know, I sought the most celebrated teachers of singing, to learn what was wanting; but what one teacher announced to me as a rule was usually rejected by another. Every teacher had his own peculiar system of instruction. No one could give me any definite reason therefor, and the best assured me that so exact a method as I sought did not exist, and that every teacher must find his own way through his own experience. In such a state of darkness and uncertainty to undertake to instruct others appeared to me a manifest wrong, for in no branch of instruction can the ignorance of the teacher do greater injury than in the teaching of vocal music. This I unhappily learned from my own personal experience when under the tuition of a most eminent teacher I entirely lost my voice, whereby the embarrassment I was under, so far from being diminished, was only increased. After this misfortune, I studied under Frederick Wiek, in Dresden (the father and instructor of Clara Schumann), in order to become a teacher on the piano, but while I thus devoted myself to this branch of teaching exclusively, it became from that time the aim and the effort of my life to obtain such a knowledge of the human voice as is indispensable to a natural and healthy development of its beautiful powers.

"'I availed myself of every opportunity to hear Jenny Lind, who was then dwelling in Dresden, and to learn all that I could from her. I likewise hoped from a protracted abode in Italy, the land of song, to obtain the fulfillment of my wishes, but beyond certain practical advantages, I gathered there no sure or radical knowledge.

"'In the French method of instruction, now so popular (1868), I found the same superficiality and uncertainty that existed everywhere else. But the more deeply I was impressed with this state of things, and the more fully I became aware of the injurious and trying consequences of the method of teaching followed at the present day, the more earnestly was I impelled to press onward in search of light and clearness in this dim domain.

"'Convinced that only by the way of scientific investigation the desired end could be reached, I sought the counsel of Prof. Helmholtz, in Heidelberg. This distinguished man was then engaged in a scientific

inquiry into the natural laws lying at the basis of musical sounds. Prof. Helmholtz permitted me to take part in his investigations, and at his kind suggestion I attempted by myself, by means of the laryngoscope, to observe the physiological processes that go on in the larynx during the production of different tones. My special thanks are due to him that now, with a more thorough knowledge of the human voice, I can give instruction in singing without the fear of doing any injury.'"

Mr. Rosengarten presented to the Society the laryngoscope used by Mrs. Seiler, *which was stated to be the first ever used in America*. At the conclusion of the memoir, the President invited those present to a light collation that had been prepared.

And the Society was adjourned by the President.

Stated Meeting, December 4, 1891.

Present, 11 members.

Mr. RICHARD VAUX in the Chair.

Correspondence was submitted as follows:

A letter of acceptance of membership from Prof. George Forbes, London, November 1, 1891.

A letter from the Coast and Geodetic Survey Office, Washington, D. C., asking for exchanges, which request was granted.

The following were ordered to be placed on the Proceedings Exchange List:

Massachusetts Agricultural College, Amherst, Mass.; Agricultural Experiment Station, New Haven, Conn.; Agricultural Experiment Station, Lincoln, Neb.; Agricultural Experiment Station, College Park, Md.; Agricultural Experiment Station, Raleigh, N. C., Agricultural Experiment Station, Auburn, Ala., Agricultural Experiment Station, Starkville, Miss., Agricultural Experiment Station, Fayetteville, Ark.; Agricultural Experiment Station, Laramie, Wyo., Agricultural Experiment Station, Providence, R. I.; Agricultural Experiment Station, Tucson, Ariz.; Agricultural Experiment Sta-

tion, Experiment, Ga ; Agricultural Experiment Station, Ames, Iowa; Agricultural Experiment Station, Fort Collins, Colo.; Agricultural Experiment Station, Auburn, Ala ; Agricultural Experiment Station, Brookings, S. Dak , Agricultural Experiment Station, Corvallis, Oreg , Botanische Verein, Provinz Brandenburg, Berlin, Prussia; Bowdoin College Library, Brunswick, Me., Library of the University of Lyons, France; Museo Oaxaqueño, Oaxaca, Mexico, American Museum Natural History, New York City, N Y., New Jersey Natural History Society, Trenton, N J.

A circular from the American Chemical Society, New York, announcing a meeting to be held in New York city on December 29 and 30, 1891.

Letters of envoy were received from the Geological Survey of India, Calcutta; Académie des Sciences, Amsterdam; Observatorium der K K Nautischen Akademie, Triest; Society of Natural Sciences, Buffalo, Secretary of State, Washington, D. C.

Letters of acknowledgment were received from the Comité Géologique de la Russie, Imperial Russian Geographical Society, St. Petersburg (135); Prof A E. Nordenskiold, Stockholm (134, 135); R. Danish Geographical Society, Copenhagen (135), Musée Royale d'Histoire Naturelle de Belgique, Bruxelles (129–134), Académie R. des Sciences, Amsterdam (131–134 and Transactions, xvi, 3), K K Militär-Geographische Institut, Wien (131–134); K. K Sternwarte (135); K K. Astron. Meteorolog. Observatorium, Triest (131–133, 135), Naturforschende Gesellschaft des Osterlandes, Altenburg (135); Prof. F. Reuleaux, Berlin (134), Naturwissenschaftliche Verein, Bremen (135); K Sächsisches Meteorologisches Institut, Chemnitz (135); Verein für Erdkunde, Dresden (135), Naturforschende Gesellschaft, Freiburg i. B. (135), Naturhistorische Gesellschaft, Hanover (135), Verein fur Thüringische Geschichte und Altertumskunde, Jena (135), Dr. Julius Platzmann, Leipzig (135); R Accademia di Scienze Lettere ed Arti, Modena (135); R. Comitato Geologico d'Italia, Prof.

Guiseppe Sergi, Rome (185), Prof. Gaston Maspero, Paris (185), Société des Sciences Naturelles et Archæologiques de la Creuse, Guéret, France (184), Prof. E. Mascart, Bureau Central Météorologique de France (185), Sir Henry W. Acland, Oxford, Eng (185); Prof. J. P. Postgate, Cambridge, Eng. (185); Department of Science and Art, Royal Astronomical Society (185), Mr Charles Leland, London (184, 185); Royal Dublin Society (185), Royal Society of Edinburgh, Royal Observatory, Mr James Geikie, Edinburgh (185), Vermont Historical Society, Montpelier (184), Prof. Elihu Thomson, Swampscott, Mass. (185), Prof. James Hall, Albany, N Y. (184); Rochester Academy of Science (185), Mr. Henry Carey Baird, Philadelphia (181–185), Wyoming Historical and Geological Society, Wilkes Barré (185); California Academy of Sciences, San Francisco (181–185)

Accessions to the Library were announced from the Naturforscher Verein, Riga, Russia, K. K Sternwarte, Prag, Osservatorio Marittimo, Trieste; Bayerische Botanische Gesellschaft, München, Société Neuchateloise de Géographie, Neuchatel, Direzione Générale della Statistica, Prof Guiseppe Sergi, Rome, Prof. Paul Topinard, Paris; R. Academia de la Historia, Madrid, Philosophical Society, Cambridge, Eng.; Geological Society, Mr. Henry Wilde, London, Hon George E. Foster, Halifax, N. S , American Oriental Society, New Haven; Wesleyan University, Middletown, Conn.; Buffalo Society of Natural Sciences; College of Pharmacy, Philadelphia, U. S. Bureau of Education, Smithsonian Institution, Washington, D. C.; Historical Society, Mr C S. Wake, Chicago, California Academy of Sciences, San Francisco; Geological Survey of Arkansas, Little Rock, Observatorio Astronomico Nacional de Tacubaya, Mexico

A photograph for the Society's Album was received from Mr Samuel Wagner

The decease of the following members was announced.

J. H. B. Latrobe, Baltimore, August, 1891.

Dr. D. Humphreys Storer, Boston, September 10, 1891, æt. 87

Moncure Robinson, Philadelphia, November 10, 1891, æt. 89
Rev. Thomas Hill, Portland, Me., November 21, 1891, æt. 78.

The Curators presented the following report:

HALL OF THE
AMERICAN PHILOSOPHICAL SOCIETY,
104 SOUTH FIFTH STREET
PHILADELPHIA, November 28, 1891

The Curators, having fully considered the matter of the Peale Stone Age Collection now on deposit at the Academy of Natural Sciences, and all the facts relating thereto, as requested by resolution of November 6, are of opinion that a resolution should be passed requesting the return of said deposit to the custody of the Society in accordance with the terms of the bequest of the late Mrs. Peale.

PATTERSON DU BOIS
J. CHESTON MORRIS.
R. MEADE BACHE.

On motion, the Society

Resolved, That the return of the Peale Stone Age Collection from its temporary place of deposit, the Academy of Natural Sciences, be now requested

The Annual Report of the Treasurer was presented and referred to the Committee on Finance.

Mr. Price moved that the consideration of the report from Dr. Cope's Committee be deferred until the next stated meeting.

Dr. Cope read the report.

The subject was discussed and Mr. Price's motion was then carried

On motion of Dr. Hayes, it was

Resolved, That the Secretaries present at the next meeting a report in writing of the cost of issuing the Proceedings quarterly and of such extra number not including the text and report a form to meet postal laws.

And the Society was adjourned by the presiding member.

Carey and Two of His Recent Critics, Eugen V. Böhm-Bawerk and Alfred Marshall.

By Henry Carey Baird.

(Read before the American Philosophical Society, November 20, 1891.)

Permit me, this evening, to ask your attention to a brief examination of the recent criticisms of Carey by two economists—the one an Austrian, the other an Englishman. Although these two writers treat the economic problem, each from an entirely different standpoint, one is as remote from an appreciation of the truth as the other, and further, neither recognizing what constitutes the great fundamental principle in Carey's system, they have both left his position unassailed, as indeed it is unassailable. The Austrian is Böhm-Bawerk, Honorary Professor of Political Economy at the University of Vienna, the Englishman, Alfred Marshall, Professor of Political Economy at the University of Cambridge.

Prof. Böhm-Bawerk has published two ponderous treatises, the first intended to be destructive of other men's reasonings and theories, and is entitled, "Capital and Interest, a Critical History of Economical Theory," the second, designed to be constructive of theories of his own, is entitled, "The Positive Theory of Capital"—whatever a "positive theory" may mean, seeing that man's vision, mental as well as ocular, being limited, and thus short of the capacity to take in the whole situation, he can have no absolute or positive knowledge—nothing more than his poor faculties permit of. Mr. Böhm-Bawerk's first book, as translated by Prof. Smart of Glasgow, makes of text, 8vo, 498 pages, the second, as translated, 8vo, 426 pages, while a distinguished professor of political economy, who thinks well of the author's labors, has recently assured me that the marrow of these 854 pages might have been put into forty pages. Such is the thoroughness of this Austrian *savant* that he inflicts upon the student of economics twenty one times as many words as the ideas he possesses are worthy of in the presentation. As for myself, I can say that I have carefully and critically read the whole of these dreary pages—dreary because of an ever recurring sense of the unsoundness of the author's premises, as well as of his conclusions.

The net result of Dr. Böhm-Bawerk's "Capital and Interest," wherein he charges Carey, in what he says of interest, of being guilty of "a tissue of incredibly clumsy and wanton mistakes," is that "*Present goods possess a greater value than future goods*," that a "*loan is a real exchange of present goods against future goods*;" and "*Present goods possess an agio in future goods. This agio is interest.*"

Such is the actual product of 498 pages of the most complex, confusing, narrow, hair-splitting, and arrogant criticism, criticism, too, by a man who has himself built up a superstructure which rests upon a fallacy. This fallacy consists in the fact that the writer has included in and treated

under "Interest" things that are not interest at all. Interest is the compensation paid for the use of the instrument called money, and its substitute, credit, always expressed in a money of account, *and for them alone*

This instrument, money, is the great instrument of association—that one thing, the possession of which, with its quality of universal acceptability, in highly organized—civilized—society, commands all other things to which we attach the idea of value. To talk of the rent of a house, a farm, or a garden, the freight or passage paid to a railroad, or a steamship, or a steamboat company, or proprietor, or the porterage in a cart, or a wheel barrow, as interest, is to add a new and most vicious element of confusion to that despair of thoughtful men, that fruitful parent of misery to mankind, the "Dismal Science" The very word *agio*, which Dr Böhm-Bawerk would apply to all manner of goods, wares and merchandise, had its origin with reference to a money of account, and to this hour it can be applied to or qualify no manner or form of thing not expressed in a money of account

Further, Dr. Böhm Bawerk has jumbled up the profit that a capitalist can make out of his own business ventures over and above the profit imagined to be properly due to his own time and labor, with the interest problem Thus does he further and hopelessly bemuddle the subject of interest. He calls this profit, which is not interest at all, interest, and which it is impossible to separate from the results of the personal exertions, sagacity, experience, and risks of the capitalist—"natural interest." Where, *in nature*, will he find interest, where trade, money, credit, houses, ships, railroads, tools, wagons, wheelbarrows, textile fabrics—where, I would ask, without the application of human labor, any single commodity to which we attach the idea of value? Are not civilized society and all its appliances for forwarding trade, commerce, production and consumption, purely the work of man, and hence artificial? Is not this *natural interest* a collocation without meaning? Is not this doctrine of Dr Böhm-Bawerk's, to use his own words, as applied to Carey, "one of those theories which cast discredit, not only on their authors, but on the science that lets itself be seduced into credulous acceptance of them, not so much that it errs, as for the unpardonably blundering way in which it errs?" For one, not only do I think that it is so, but to me it is a source of wonder and amusement, that the perpetrator of such blundering can criticise others in the severe and arrogant terms in which Dr Böhm-Bawerk has done

But what is to be thought of his treatment of Carey? Why, that it is simply infamous, for the reason that the necessary preliminary to refuting and denouncing him as guilty of a "tissue of incredibly clumsy and wanton mistakes" has been his misrepresentation. In order to refute him, he has been forced to attempt to make it appear that Carey was guilty of the stupidity of treating *distribution*, as Dr. Böhm Bawerk has done, as *interest*, not *distribution*. What Carey himself calls "the law of distribution," he calls "Carey's interest theory." After quoting what Carey distinctly states regarding *distribution*, and which he calls such, he

comments as follows "On these preliminary facts, then, Carey builds his great law of interest; that, with advancing economical civilization, the rate of profit on capital—that is, the rate of interest—falls, while the absolute quantity of profit rises" (the interjected words, "that is, the rate of interest," being Dr Böhm Bawerk's, not Carey's) Carey distinctly and emphatically says "*Interest is the compensation paid for the use of the instrument called money, and for that alone*" And again "When a man negotiates a loan, he obtains money for which he pays interest, when he borrows the use of a house, he pays rent; when he hires a ship he pays freight"

This dictum of Carey's is not merely clear and to the point, but it is in accordance with the common understanding of mankind To change it as Dr Böhm-Bawerk has attempted to do, is to bemuddle and confuse the subject Before he and his translator obtain the right to arraign Carey as "a confused and blundering writer," it is incumbent on them both to show that his definition is wrong, and that Dr Böhm-Bawerk's definition is correct, and the only correct one. Until they have done so, their denunciations obviously prove their own incapacity properly to criticise a man of Carey's originality, lucidity, power, and far-reaching influence upon mankind

Of the numerous economists whose doctrines Dr Böhm Bawerk has attempted to criticise, none has he denounced in terms so opprobrious as those applied to Carey and his distinguished disciple, E Peshine Smith, and yet of all these men, the philosophy of none but Carey and Smith is capable of explaining the real cause of interest, or of clearing up the confusion into which Dr. Böhm Bawerk has become involved regarding value

Interest owes its existence to precisely the same cause and conditions as does money—the necessity under which man stands for association and combination with his fellow-men But for this necessity there would be no interest, no money, indeed no political economy Any system, or pretended system, of political economy which is not grounded on this great principle of association, this overmastering condition of man's nature, is false and misleading, a delusion and a snare—a system of confusion leading not only to further confusion, but to the wreck of the hopes, the rights, the civilization of mankind The system of Dr Böhm-Bawerk does not even remotely recognize it, he has not even the faintest glimmer of it, although all political economy is and must be concerned about it. He has dropped out of his system the great fundamental law, the great dominating fact as to the existence of man in society His system is therefore of necessity not only useless, but worse than useless.

The second treatise of Dr Böhm-Bawerk, "The Positive Theory of Capital," gives us, as a net result, the old and exploded wage fund theory of the economists, with, as an annex and as a result of his interest theory of present goods possessing an agio in future goods, the effects of extension

of processes of production and the number of producers to be provided for during all these imaginary processes—extended or non extended, though they be. In fact, he has added to, not decreased, the complication which arose out of the unsound and even absurd wage fund theory, involving, as it did, a fixed "national subsistence fund."

Attempting to bolster up the theory of saving as a source of capital, Dr Böhm Bawerk has no real conception of the actual source of capital His whole theory is antagonistic to the truth that wealth consists in the power of man to obtain mastery over nature, and that capital is the instrument by means of which that mastery is acquired, and further, that capital accumulates in the exact ratio that consumption follows production, and that matter takes upon itself new and higher forms—what we term consumption and production being mere transformation of substance; in other words, the more continuous and rapid the motion of society, the greater the power to accumulate capital and to acquire wealth

An entire "book" is devoted to the discussion of "Price," in which even a definition of that vital word is wanting, the evidence being therein presented, in abundance, that the author is quite unaware of the fact that price is the expression of the power of a commodity to command money in exchange, and is always expressed in a money of account.

While two entire volumes are filled with discussion looking towards the effort to establish the cause of interest and of the rate of interest, Dr. Böhm Bawerk has not even the most crude conception of why it is that people are obliged to borrow money or credit, or goods, or rent houses, or factories, or why one man buys and another man sells labor power If he had recognized association with his fellow-men as the most dominating necessity of man's nature, and that money, with its qualities of universal acceptability, and of almost perfect divisibility and aggregation, was the necessary instrument of association, he would not have inflicted upon mankind such a tissue of learned fallacy in reference to "present goods" and "future goods," labor wages and the wage fund theory Above and beyond all, he would not have made those fundamental errors as to interest, which is paid only for the use of money or credit expressed in a money of account, but which he has jumbled up with the hire of all sorts and kinds of goods, wares and merchandise. He does not even know why "present goods" possess what he calls an *agio* in "future goods," i e, because of the necessity under which man stands for association and combination with his fellow-men.

MARSHALL.

Under the title of "*Principles of Economics*," Prof Marshall, of the University of Cambridge, has published the first volume, 754 pages, of a treatise in which no great broad principle is presented, in which no end of petty details are given, and in which not a single clear and valuable analysis of economic phenomena is to be found, and in which an entire absence of the true capacity for analysis is shown The profundity of

Prof. Marshall may be judged from the fact that he says "It makes indeed little real difference to the life of a family whether its yearly income is £1000 or £5000." No one but an economist could enunciate such nonsense, and still retain his position as an authority in a high department of knowle ge.

His book, largely accepting the doctrines of Ricardo, is full of apologies for him, and for his inaccuracy of statement. For instance, he says

"His exposition is as confused as his thought is profound He uses words in artificial senses which he does not explain, and to which he does not adhere, and he changes from one hypothesis to another without giving notice If, then, we desire to understand him, we must interpret him generously, more generously than he himself interpreted Adam Smith When his words are ambiguous, we must give that interpretation which other passages in his writings indicate that he would have wished us to give them "

It is quite proper that a teacher who can talk in this style should have no difficulty in deciding that Carey and others who have refuted Ricardo do not understand him After myself reading "Ricardo" more than thirty years ago, I told Mr Carey that I could not understand what he was driving at His reply was, "Ricardo did not himself understand " Nor do I think he did. Confusion in language involves confusion not merely in argument, but in thought; and in no other department of knowledge but that of political economy, would it be possible for one who needs such apologies, as those made for Ricardo by Prof Marshall, to become the founder of a distinct school

The blunders which Mr Marshall has made with reference to Carey and Frederick List, and especially as to the indebtedness of the former to the latter, are most remarkable.

For instance, he says Carey was born in Ireland, when, had he taken the least trouble to examine any biographical notice of him, he would, at a glance, have seen that he was born in Philadelphia. Then he asserts that List's "Outlines of a New System of Political Economy," a tract published in Philadelphia, 1827, and its wide circulation were "the beginning of his fame, as it was of the systematic advocacy of protectionist doctrines in America," whereas this movement was commenced in 1819, and Mathew Carey was one of the originators of it; and three years before the appearance of List's tract, or in 1824, the first really protective tariff enacted in the United States was passed

Then he says that this publication of List's was made ten years before the publication of Carey's first important work, his "Principles of Political Economy," and adds, "Carey owes many of his best thoughts on protection to List "

Now, Carey's attention to economic subjects commenced in 1835, when he published his "first important work," the "Essay on the Rate of Wages," and there is not a particle of evidence that he ever read the insignificant little tract of Frederick List. If he ever did he wholly failed

to profit by it, as in all of his earlier books and papers he advocated the doctrine of *laissez nous faire*, never having publicly declared his adhesion to protection until the publication of "The Past, the Present, and the Future" (1848). Nevertheless, in each of his early books will be found the germs of those vital and far-reaching principles which he so grandly developed in his "Principles of Social Science," his progress from 1835 to 1860, and even to 1875, having been steadily onward. By the beneficent practical working of the tariff of 1842, he was, in 1844, induced by the logic of events to range himself on the side of protection as a necessary national policy. But it was not until 1847 that he was able to reconcile it to economic theory.

In 1847, when he had outlined his law of the occupation of the earth, which has completely overthrown the basis upon which rested Ricardo's theory of rent, he readily emerged from the last vestiges of a belief in so absurd a theory applied to an artificial society as *laissez nous faire*. Lying in bed one morning, picturing to himself the settlers on the sides of the hills, moving down into the valleys and approaching each other, as wealth, power and civilization grew, he realized the vital importance of bringing the consumer to the side of the producer, and, as he said to me, "I jumped out of bed, and, dressing myself, was a protectionist from that hour."

The fact is Carey, not having studied German until 1858, List's "National System of Political Economy," published in Germany in 1841, was to him a sealed book until 1851, when a French translation by Richelot appeared in Paris. Carey's copy of this book in the Library of the University of Pennsylvania, with his pencil marks in it, showing passages which he considered striking, clearly proves that he made but little use of it.

But the question of Carey's position as a social philosopher is not to be determined by whether or not he picked out from some other investigator one idea here or another there, but by his philosophy as a whole. His great merit does not consist in the fact that he has demonstrated that association and combination with his fellow-men is the greatest need of man, or that in the utilization of labor power—the most perishable of all commodities—is to be found the measure of the growth of a people in wealth, power and civilization, or that money, the instrument of association, by giving utility to billions of millions of minutes, which without it would be wasted, acts as a great saving fund for labor, or that a necessary condition of advance in civilization is that man passes from the use of poor tools, including poor lands, to the use of good tools, including good lands; or that value is the measure of the power of nature over man, and is to be found in the cost of reproduction, while utility is the measure of man's power over nature, or that, with the development of this last-named power, distribution takes place under a law by virtue of which to labor goes a large proportion of a larger yield—freedom thus growing with the growth of wealth and civilization.

It is not by reason of the clear demonstration of any one of these great

truths, or of all of them, but of their demonstration *plus* the interlocking and the interweaving of these vital truths into one great and harmonious whole. Thus and thus only is it that he has presented a system of social philosophy deeper and broader than that of any other economist from the days of Plato and Aristotle down to our own time. By this touchstone —fundamental truths with their relations to each other, worked out into a complete system—is it that Carey is to be judged, and judged rightly and justly, and not by mere verbal criticism, or by an attempt to prove that an idea here or another one there was previously promulgated by some other teacher

A great admirer of Fredorick List, for what he had done in building up the German Empire—a work without which Bismarck, Von Moltke, and William I would never have been heard of in history—Carey had but a poor opinion of List's "National System of Political Economy," for the very good reason that it lacked just what he had aimed to present in his own books, and what are absent in Prof Marshall's volume, broad, deep and enduring fundamental principles, interlocked and interwoven into one grand and harmonious whole, like Carey's own great and noble 'Principles of Social Science" Indeed, no such voluminous writer on social subjects as Carey has ever lived and written who has paid so little heed to the writings of other economists His own economic and statistical library, now in the Library of the University of Pennsylvania, will bear me out in this statement. Colwell collected the writings of political economists, Carey collected those of travelers, historians, statisticians and scientists, and to these he went for the material out of which to demonstrate those great principles which will ever bear his honored name.

How far Carey has been successful in impressing his philosophy upon the people of the United States, and upon the national policy, is well depicted by a recent and far from friendly critic as follows "Measured by results," says Prof Levermore, "the Carey school, and not its opponent, has achieved success in the United States. For thirty years, the stone which the builders rejected has been the head of the corner. Carey and his friends never captured our colleges, but, for a generation, they had dominated five-sevenths of the newspaper offices, a pulpit far more influential than the professorial chair The arguments to which Carey gave form and eloquence are in the mouths of more than half the business men and farmers of our country, and, in the last Presidential campaign, the Republican party reaffirmed the extremest principles of the Carey school, including even the rancor towards England, with a violence and absoluteness that would probably have surprised Carey himself" ("Political Science Quarterly," Dec, 1890, pp. 572, 578).

The reason for this is not far to seek Carey dealt in broad and enduring principles so interlocked and intertwined that any man of ordinary intellect, once captured by them, might ever after during his life bid adieu to the hope of freedom from their intellectual domination

Nihil est veritatis luce dulcius. Indeed, nothing is sweeter, nothing

more delightful, than the light of truth, and Carey has given to mankind a great body of truth, instinct with life and being, an organic whole demonstrating those principles which govern the well being, the happiness and the civilization of the human race. The destruction of the foundations of this system demand men of greater power than Eugen V. Böhm Bawerk and Alfred Marshall. They have not even made a lodgment in the outworks. In the citadel all is calm and serene, without apprehension of successful attack by such incompetent leaders—leaders who lack at once a knowledge of even the elementary principles of economic truth, and the power to group and place in proper relation to each other those things which they do teach, if, indeed, their theories have any connected relations one to another. If they have such relations, these gentlemen have failed to show them.

Vocabularies of the Tlingit, Haida and Tsimshian Languages.

By Dr. Franz Boas.

(Read before the American Philosophical Society, October 2, 1891.)

The following vocabularies were collected by the author when studying the Indian tribes of British Columbia, under an appointment of the Committee of the British Association for the Advancement of Science, appointed for the purpose of investigating and publishing reports on the physical characters, languages, and industrial and social conditions of the Northwestern tribes of the Dominion of Canada. It was decided that in the report of the Committee a brief comparative vocabulary only should be printed. As, however, the languages of the North Pacific Coast of America are little known, the vocabularies may be found to possess some value.

The following alphabet has been used:

The vowels have their continental sounds, namely: *a* as in *father*; *e* like *a* in *mate*, *i* as in *machine*; *o* as in *note*, *u* as in *rule*. In addition the following have been used: *ä*, *ö* as in German; *â* = *aw* in *law*, E = *e* in *flower*.

Among the consonants the following additional letters have been used: *g̣*, a very guttural *g*, similar to *gr*; *ḳ*, a very guttural *k*, similar to *kr*; *q*, the German *ch* in *Bach*; H, the German *ch* in *ich*; Q, between *q* and H; *c* = *sh* in *shore*, ç = *th* in *thin*; *tl* an explosive, dorso-apical *l*; *dl* a palatal, dorsal *l*. ' following a consonant designates the u position of the organs of articulation.

I ENGLISH-TLINGIT.

STIKEEN DIALECT

A

above, on top of, ka.
Acer tlrā'tlrē
adam's apple dlētu'q(1) kagu'ntlē(2) = neck (1) ? (2)
afraid (akū tl) qētl
again dētsō
ahead ıān
Alnus kē'cic.
always dj'ētlu'k, yūk a
Anas boschas kindētcunē't = moving straight up
—— *clypeata* k·tn.
—— *histrionica* ts'utsk.
ancestor acukus.
angry k 'ant—wa nuk
ankle k 'ōs t'aktl = foot knuckle
Anser t'ā'wak
apron, woman's, cūqe't'a.
—— *dancing,* ax'n(1)k·ēt(2) = ? (1) apparel (2).
apparel, wearing, k ēt.
Arctostaphylus uva ursi tinx.
arm, hand, djin.
armor, wooden, tlrā'tlrē (= Alnus)
—— —— *of parallel sticks,* ax'n k ēt (see *apron*)
—— *held in mouth,* k 'a(1)kuē't(2) = mouth (1)
Arnica cordifolia an(1)ka(2)nā'gu (3) = town (1) on (2) medicine (3)
around, outside, da.
I walk around house hit da ya qoa gūt.
arrow tcunē't = moving straight.
—— *double-pointed,* tcunē't k 'atlā'k ē.
ashes k 'an itē' = fireplace.
Astur atricapillus kȷ ēdjn'k.
Atlda, name of a place.
aurora k 'an(1)yiq(2)k ō(3)watē(4) = fire (1) like (2) out of doors (3) color (4)
—— gyits'ō'k.
axe cxnqoā'rl
—— *stone,* kȷ ē't'ō.

B

baby g ata gua'tsgō (male and female)
back dlk
—— *of hand* djin kētl
bad tlētl wu c k'ē = not good
badger nōsk
bark gan da = wood around
basket for blankets nū'etl.
—— *for berries* k'ak'
bat tsik'ıēdlā'n
to bathe daxūtc
baton of shaman wū'sag'a'.
beach tl'ēn'ā'tē = sand place.
bear, black, ts'ēk
—— *grizzly,* qūts.
—— *white (polar),* tāq
beard k 'atatsā'rē
beaver ts'ikıēdē'.
bed yē'at — something to lay on (Chilkat).
bedroom ıt
bee gandasā'djl.
belly yūra'
belt sī'gi
berry tlēk'.
—— *salmon,* wutst'ān tlēk'.
—— *black,* gawa'k (Rubus).
—— *dried,* atka qōk .
—— *black,* t'ōtc tlēk' = blackberry.
Betula glandulosa tlētl'a.
—— atlā'rl

bird iö'tll.
—— *a species of, with red wings,* kön.
black t'öto (see *soot*)
blanket tl'ö
—— *cedar bark,* tsätlk k 'ö'ñ
—— *martin skin,* k'öq k 'ö'u
—— *Chilkat,* nä'qëin.
Blennius sp., dlüt'
blind tlk·öt.tën
blood cl
to blow (wind) dö'wanuk
to blow uq
blue ts'öyl'qatë (ts'ö? yiqatë = colored)
—— *jay* k 'eck'
board for drying salmon ganitë't = smoke place.
bone s'ak (see *tall, short*).
boom s'x'as tö s'ä'gë = sail in oblique
bow of canoe cekx'.
bow sxk a.
bowstring sxk·s nä'sö = bow guts
box köt. tlak t
—— *large,* tluk·t tlën
bracelet kls.
Brachyrhampus marmorata ts'lt.
braid cs ksal't (cs = head).
brains tlak ögl'
breakers tlt ra tl'ëk (tlt = wave)
breast së'tk a.
breath dxsë'uk
brother, elder, unu'q.
—— *younger,* kik'
brother in-law (wife's brother) kan
brush xl't'a.
—— *for clothing* at k·a xl't'a
Bubo virginianus tslsk'
Buccinum tl'ltlk'.
bucket k 'ö'cs.
butterfly tlëtlu'
by and by yldxiqx'ëga, tlits'a'

C.

calf of leg ts'ä'yu.
Caltha palustris staguë'k·ë.
cambium of Tsuga sak'
Canace obscura nukt
canoe yäk'
—— *Tlingit,* ylt
—— *Haida,* wutsdë'
Cardium Nuttalli (cockle) g 'atl kx'tsk
cariboo wutsl'x
carpet nëtlritl'rl'tl
to carry in hand rsn—tsn
cat düc (Chinook)
cedar, yellow, qär.
—— —— *young,* tlxqrx'të
cedar bark tlr
—— —— *prepared for weaving mats* rüt
cedar (and spruce) root qät
—— —— *hat* qät ts äq
Ceryle Halcyon tlaqsnëts'ö'.
chair ks ra kl'djet = on top of which one sits
chatterbox k 'a tlëyö's = mouth playing (see *to lie*).
cheek wac.
chief ank ä'ö (see *rich*).
child g lt'a'
chin tög'
Chiton Stelleri cä'u
—— *tunicata* kör
Circus Hudsonicus qëq
clear, it is, weather, u ks wa qats.
cloud güts (see *heaven*)
cloudy k ü tlt güts = it is out of doors cloudy
club g 'ats (see *crabapple tree*).
coal t'öto (see *black*).
cold sis't.
Colymbus glacialis k xg ë'lt.
column, heraldic (totem post) kötö'rs.
comb qedu'
common people tcä'n (see *poor*).
cone of Picea ts'öt.ä'ne.
to cook (at—)sxö'
copperplate tins'.
cormorant yök.
corpse narë'.

cotton goods s'ɛ'sa (see *sail*)
Cottus sp. wēk'
council atkaqtcā'k.
country ā'n(ē)
cousin (father's sister's child) at.
—— (mother's sister's child) tlak' (see *sister*).
crab s ā'n
crabapple tree g 'uts.
crescent (see *moon*)
cross (*minded*) k 'an—rnō (see *angry*)
crow ts'ɛ'quctl.
crown of head ca kī = head top
to cry g āq
Cychrus longicollis as k 'tō ylk ca' = woman in the woods, as k 'tō = woods, ca = woman

D

dagger tsā'g atl
to dance a—tl'óq
dance of shaman īqt dāklē'de
dancing apparel tl'ōq k ōt
danger at sea kātluqō'tlozn
—— name of Yetl's mother, K ōtsō terlɛ't.
daughter sī (probably child, said by mother).
day yigɛrī' (see *noon*, *to day*)
daylight k ēwa'
dead (na) na.
deaf tlk otl'ɛqtc.
deer k akā'n
dentalia tē'k e
difficult tli tsō
dish grease g'ɛknnē'
—— *of mountain goat horn* tll'nēt ts'lk'
dishes nūk'
diver ts'uts.
to do sl yi—elnū'
dog kyētl.
doll sī (see *daughter*)
door k 'atā't
dragon fly tlk'acēcqā'wu = no man head-hair. They are said to sing · tlētl(1)qat(2)ca(3)caqawu (4) = not (1) I (2) on (3) head hair (4) = no hair is on my head
to dream a—djūn.
to drink tana'
drum gā'u
dry wa qōk.
duck g'uts.
dust tc'ōs, k ca'ē'dja.

E.

eagle tc'āk'.
—— *black*, tc'āk'(1)lē'ɛ(2) = eagle (1) black (2)
ear gūk.
earring djāc.
east wind nānaqē't
—— tl'ak'ak'a'q (Chilkat).
easy tlētl tli tsa = not difficult.
to eat (at—) qa.
ebb tide rcnatlē'n
eggs of lice nīts.
elbow t'ēr.
elk taiak'.
Empetrum nigrum qtitōwu'ts'ē
empty aqu'ktlē.
end cɛ.
Epilobium angustifolium k ō'kān nā'k' = deer medicine.
ermine da
evening qā'na
excrement hā'tlē.
eye wak'.
eyebrow ts'ē
eyelashes wak' qā qē'q'ō.
eyelid, lower, wak' tɛrī.
—— *upper*, wak k'a'.

F.

face rɛ.
far (na) tl'.
far out into the sea dēkyī.
fast rnalyē'k.
fat, for greasing face, rɛ nēts'ē'.

father îc.
father in-law rû
fathom wât (see *tall*, probably *length*)
—— (from elbow over breast to finger) k ât'ê yîq ku wât
—— (from shoulder over breast to finger) qîk es gu'ntlê yîq ku wât.
—— (shoulder to finger of same arm) qîk on yîq ku wât.
—— (elbow to finger of same arm) tolk e yîq ku wât
feather k 'oâ'tl.
feather bed k 'oâ'tlriâ't = feather place
to feel, I feel better, ag a otuq dênôk
fern tsâts.
to fight g'an
finger tl'uk· (see *toe*)
—— *first*, tc eq
—— *second*, tl'ēk (1)tlēn(2) = finger (1) great (2).
—— *third*, tl'ök (1)g'a'tsgô(2) = finger (1) small (2)
—— *fourth*, won ka tc'ēq (see *first finger*).
fire k 'ân
fire drill tôutlê' (see *round*, and *to turn round*)
fireplace k·'an î'tê = fire place.
fish, fresh water, hîn tak'a'tê
—— *a small species*, ka'ê'ts.
fish line kyê'u
—— —— *of kelp* tlera'uê.
fishotter nukrēyâ'n
flood tide dâk nadê'n.
flounder tsx'nt ê.
to fly dê'k en.
foot k 'ôs.
forehead kâk·.
fox nag âts'ê' (borrowed)
friend qonê'.
frog xîqtc.
in front of k 'ê'yê (Chilkat)
frost kaquâ'n.
Fucus vesiculosus tarê'dê.
fuel gan (k 'an ? = fire)
full cawahik
fur seal q'on.

G

Gallinago Wilsoni gûtsrê tôtll = heaven bird
geese tân
get up! cû'ndx!
girl câtk·
to give djêt—tê
—— *give me to drink!* hâhca qa tana'!
to go gôd, at
I go to town ân(1)k 'ê'yê(2)dê (3)qoa(4)gût(5) town (1) in front of (2) ? (3) I (4) go (5) (Chilkat)
good (rx) k'e
good-natured (th) an
grandfather, mother, tlotk·
grandson cqa'nkê
grass tê'uk
grease êqê'.
gull kye'tlxdi'.
gutts nâse'
Gutscxtla, Chilkat name = horizon mother.

H

Haida Dêkyina' = people far out seaward.
hail kadx'ts.
hair ca qâ'wu = head hair
hairdress of shaman k its.
half ca'rê
halibut tcâtl.
hand djîn
Harelda glacialis yâau'nê
Hatkanax'kô = old woman under us, a mythical person
hat ts'âq.
—— *war hat, shaman's hat*, wak·(1) k êt(2) = face (1) wearing apparel (2)
to haul ta sî'yîk·.

he hu, hūtc, qasiē'.
head ca.
head ornament used in dances cā k·ēt.
to hear aq, aqtc
heart tēk
heaven gutsurē' = cloud place.
heavy (re) datl, (tll) tsē'
heels k 'elak'
heron tlak'
herring rā'u
herring rake nl'tla (see *brush*)
high water ran k 'atwada'
his tō(—rl)
hoof agnē'ntlē
hook, halibut, naq.
—— *round,* t'ēq
horizon k ū gātu
—— gutsca = sky end.
horn cēdi
horse gyūdā'n (Chinook), dik ka ra kidjēt (Sitka) = back upon sit.
house hit.
—— *dug out part in centre of,* tāk
humming bird tag atg·iya'
hungry, probably ran *I am hungry* qat ran owa ha, *it makes us hungry* haut ran a wu at ha; *if I am hungry* qat ran hu'nō.

I, J

I qat, qatc
ice t'ēk'
icicle k'lrl t'ē'k'ō = above ice
inside iō, g ō
it is inside white a g ō ru
instrument rarē't
island k 'āt.
ivory cuqdu'k
jaw, lower, q'ata.
just a short time ago, rasū'

K

kelp gīc.
—— *swimming apparatus of,* kutlt'ē'
kelp cake tlāk a'uk.
kettle, wooden, ōq'akā'gaate.
kidneys kabā'gō
killer (Delphinus Orca) kyīt.
knee kyīr
kneejoint sā'rē
kneepan ca k unū'k'ō
knife tlia.
—— *large,* wēka, gwa'tla.
knothole in a board k ata.
to know aqtc = to hear often.
—— cagōk = to understand
knuckles (djin) kagu'ntl.
Kyluastl'ac, name of a man

L.

labret g'ak'
—— *silver nail,* k 'annōq (k 'a = mouth)
—— *large plug,* k 'a nd'āk 'a'
ladder dzēt.
Lagopus albus k 'ētauwa'.
lame tlak a'tck
language yuq'ata'āgl (see *to speak*).
large tlēn, yūk' tligō' (?).
to laugh (at—) cō'uk.
to leave k'ōwatē'n
Ledum palustre ta'lko' etldi'n
left hand, ta'atnaql (djin)
leg k 'ōs.
—— *of animals* atca'kari
—— *above knee* k ats.
leggings k 'ōs k·ēt = leg clothing.
liar k 'ā tlē'yē a'a'tc = mouth play master
life tsēn
light tlētl wu datl = not heavy
lightning nētl'ē'gu = thunder bird opens his eyes.
like yiq = similar to.
Lina sp. rāg 'n wē's' = sun lice.
lip, upper, k 'a tlō (k'a = mouth)
to listen (at—) at 'q (from aq = to hear)
little ga'tsgō.

liver tl'ōk·
long ku wa't, ye—ku wat (see *fathom*)
—— ku darō't.
long ago te'ōtlā'k.
a long time (dā) te'āk'
loon cuwā'n
louse wūs'
low water ran ōwa tlā.
lungs kyēgū'.
Lupinus ka'ntak.
Lycopodium clavatum k·ō'kan si'gi = deer belt.

M

to make si
man k s, tlōlngi't.
many k tōq
—— *men* k u ciri tibē'n
—— *things* at ciri tibē'n
married, baptized, hin quröd̄ōwatē' = face put into water.
marten k'ōq
mashed kaqu'k'tl
mask wuk katadu'k = face not perforated.
mast sx'sa (tō) s'sē = sail in tree.
master s'a'tē.
—— *of the upper world* Tahī't.
mat, made of cedar bark, g ātc.
match, rubbed cedar bark, g ātc.
may be—gūtl.
meat dlīr
medicine nāk'
Mergus serrator hin yīkag u' = water rim.
midnight tatari'n (tāt — night).
mind torū'
mink tlēnik'u'qū
month dis.
moon dis
—— *new,* kā'wakis = all out.
—— *first crescent,* wulsik ē'n.
—— *half,* dis cu'rō.
—— *full,* dis ran rā'wawat
moon, last crescent, rārē kā'nakis.
morning ra k'ē'naēn, ts'ō tāt = blue night.
mortar t'ēk 's ris'ti = pounding place; ka qu'guaret = rubbing upon place.
mother atli'.
mother-in-law can.
mould tlaq
mountain goat tōwē'.
—— *horn* tlīnē'tl.
mouse, shrew, kag·ā'k
—— kuts'i'n
mouth k 's.
musk tlēq
mud ts'ēn, k utlk.
mussels rāk.
my aq (—ri)

N

nail qak·
naked katkdara'k.
navel kō'utl.
neck dlētu'q
necklace s'ak· sāt = bone necklace.
nephew (sister's child) k·atlk·
—— (brother's child) g it'a' = child
net g ē'wū
new nēg
night tāt.
no tlēk'.
noon yigari'.
north wind is blowing qōn dō-wanu'k
nose tlō
—— *ornament* tlō n naa.
—— —— *of shaman,* wak k·ēt = face ornament.
nostril tlō tōru tlī.
not tlētl.
nothing tlōk'.
now hē'kdat, yā'ridat

O

oak duk
oar aqa kdara't = long paddle.

oblique s'ā'gō
œsophagus tlēkatcu'q'ō
Oidemia perspicillata k āq
—— *sp.* klto ka ru = wing on white
Olachen sāk
old man cān
—— *woman* cā'wat cān
on top of ka.
—— *I put it on top of*, akayiqa'ō
one eyed tlecatwa'k ē
to open one's eyes tl'ik'
to open a salmon tlag ʀ'ts
opposite kikʀ'
otter kucta.
—— *people* kucta k a = otter man
our ha (—ri)
outside da.
—— *the house* k ū
owl, white, k'ak'

P

to paddle adlqa'
paddle aqa'
to paint nēguo'tl, kʀ—cʀsl't (see *brush*)
painter nēguō'tl s'a'tē = painting master
paint, black, for face, t'ōto = soot.
—— *red, for face,* tlek.
palate ky'ē'k tlʀn.
palm of hand djin t'āk (see *plant*)
Parmelia s ē'qōnē
Parus (*titmouse*), k ā tōrū' = man's mind
perforation of nose tlō tō rū tlı
pestle (ka)t'ē'k'a = (upon) pounder, (ka) qt'gus = (upon) rubber
Pica Hudsonica ts'ēg e'nē
to pick gūk
pipe ts'ek da kēt = smoke around box.
place for something rerō't, rlā'tl.
plant of foot k 'ōs t'āk (see *palm*).
plate k 'eyū't — something in front of (Chilkat).
plate made of slate tʀts'ō'k
point tlō
Polygonatum tlēk'wa hintē = water berry
Polyporus as tak s'dl = tree biscuit
poor lcā'u, k 'antckldu'q.
porcupine qatla g'ʀ'tc = hair sharp.
porpoise tcīto
post gādz'
to pretend to be rich (tc'ʀ) ck 'a—tll nōk'
—— *to be hungry* (tc'ʀ) tō—ran s ha.
—— *to be a Tsimshian* Ts'ōtsqʀ'nqe—tlē'q.
puffin qelk

Q.

quiver gaē'tl

R

rabbit g āq
racoon s'āq
rafter kaqret.
rain sū'u
rainbow kiteqanag ā't = many colored wing
it is raining (dāg) sōte'n.
raspberry tlōk' we'dē
rattle, made of puffin beaks, djin kaqʀ'ta (djin — hand), dje kaqʀ'ta.
—— *shaped like a skull,* cūcu'q
raven yētl
razor k areyi'qa.
to recover from sickness (wu) nēq (see *to save*)
red k 'an yiq atē = fire like color
reeds tlak rīdzō
rib ts'ōk'
Ribes qahōwu'
rich ank ā'o (see *chief*)
ridge of house s'ōrʀtō'
right hand cirʀneqi (djin)
ring, finger, tl'āk kakls = finger on ring (see *bracelet*)

ring, foot k 'ŏs ka kīs = foot on ring.
rock (small island) nō
roof gan, hit ka = house-top
rotten tl'ok
round tōutloān (see *to turn round*)
to rub with pestle ka—tlᴇqᴇk'tl.

S

sail s'ᴇ'ᴇa (see *cotton goods*)
salmon qāt
—— *humpback*, tcāta.
—— *spring*, ᴋ ut
—— *hookname*, tl'ō'uk
—— *dog*, thīt l
—— *white*, t'ā.
—— *dried*, atk 'ēci qōk (qōk = dry)
salt ētl qōk = dry sea.
sand tl'ē'u
satiated cāwa hik.
to save nōq
Saxidomus s'ō'nk ? gātl
scraper ᴇl'tᴇ'a
sea rᴇk·ā'k ētl
—— *heavy* āgōwatā'n
seal tsā.
sea lion tān
sea otter yuqtc
to see tēn, ᴋō ē'n, tlī tōn.
septum tlō t'uka'
shaman iqt
shark tūts'
sharp tlᴇg'ᴇ'ta.
sheep, big horn, djᴇ'nū
sheets s'ᴇ'ᴇa ka rē'gaē
shell sp ? lē'ᴇ.
Cik 'ā' tlūtō', a point near Sitka.
shoe tītl.
shore line hin k 'a'cō (hin = water)
short ku watl
shoulder qikca'
sick nēk'.
sinew, thread, taa.
to sing (at—) ci
sister, elder, tlak
skin dōuk.

skull ca s'ak = head bone
—— *of a corpse* ca k ᴇqā'go
sky, clear, akawaqa'ts
—— gutsᴇrᴇ = cloud place
slave gō'uq
to sleep ta.
sleepy (rᴇ) ta owaha'
small ga'tsgō
to smell tsinē'ky
smoke ts'ēk
to smoke ak'a da ts'ēk = mouth around smoke
smoke hole gāt, gān
—— *roof of smoke hole* ganē'tlē
snail tāk
snake tl'ut tlā'k
snow dlēt
it is snowing ara kawa dan
son g it'a' (probably child, said by father)
son-in-law kaa, sōq'u'q (?)
song of shaman iqt k 'a ci'reē
soot t'ōtc
Sorbus kᴇltcanē't.
soup, made of berries, qu'ktlē
south wind is blowing rᴇ'ndēu dō'wanuk
sparrow-hawk ganō'k
to speak yug'a—tkū, rᴇka'
Spermophylus Parryi tsātlk'
spider k asēst'ā'n
spirit yēk'
spoon citl
—— *large bailer*, cin
—— *short*, cᴇ'ca.
sprout wuts.
squid nāk'
—— *used for bait* nᴇq nāk'
squirrel kanātltsā'k.
—— *a small species*, tlk·ōqwē'tsa.
to stand gya.
stand up! gyidā'n !
star k·utsq'a'rᴇnaha.
to steal tā'ō
to steer yūru tlaa'.
steering-paddle rᴇdl'gā.

stern of canoe gylkka′
Sticta pulmonaria scakarë′ol
stockings tl′ëg′u′n
storm ara ödötë′
stone the
stout ku tla.
straight, upright, kin de tcun.
—— *ahead* rān de tcun
stomach yuru′
stop crying c′îtlk′g′tl
storehouse in the woods toztl
stranger t′anyū′t
strawberry cak′
street dē
strong (*rope, etc.*) tli wu′s.
—— (*man*) tlī tsō′n (see *life*)
summer k utā′n
sun (ra) gān
the sun is shining (dag) gān
sunset rë anani′g
sunrise ky′ë anani′g
swan g·uk tl
sweat t′ār
sweat-lodge qār
sweet tli nukts
sweetheart tsōrī′
to swim rāndat′g′tc.

T

tail tl′ēt
tall (yō)—s′ak ku wat = bone long.
temples wak cu′ (wak = eye)
then adaqal′o
their hasto (—ri)
they has, hasto.
thief tā′ū s′a′tē = stealing master.
thin qun
thine i(—ri)
to think of somebody su—s′ēt′g′n
thou wue′, wue′io
thumb gō′uc.
thunder, thunderbird, nētl
tide hāt
tired (wu tl) quē′tl.
Tlaqkōle, Chilkat name = perpetual man's father.
Tlingit tlēingi′t.
tobacco g ānte.
to-day tā′y igari.
toe k ′ōs tl ēk = foot finger
together wūctēn—ts
—— *we laugh,* at tö ts cō′uk·
to-morrow sērë′nk
—— *day after,* sērë′nk tlinakutē′n
tongue tl′ūt
tooth ūq
town ān (see *country*)
trap te′q.
tree kats
tribe na.
—— *the heavenly,* k′ë′wa k ā′oqā′wō
Tringa syahli′a.
trout k ′tā′t.
trunk k ö′uk ok
Tsimshian Ts′otsqa′n
Tsuga ran
to turn round tōutl (see *round, fire-drill*)
to turn back, on foot, k·uq k atudaa′t
—— k aqudigu′t.
—— *in canoe,* k uqritla′
the tide turns ara kān dīda′
twins wūtc kikra′dē = two together opposite

U

Ulva k ′ate.
uncle (father's brother) sā′ni.
—— (mother's brother) kak.
up dē kī
uvula nūt′ari.

V

Vaccinium Vitis Idaea nēgū′n
—— *uliginosum* ts′ïk′a′qk′
—— *ovalifolium* kanat′ā′
Valeriana tltcaniatā′k·
vein ts′ika.
vertebra dik s′ak = backbone.
very .lēq, sitē′

Viburnum acerifolium k ngwā'q.
village, winter, tak'anō'
—— *summer,* k 'utā'n
voice uōk.

W

to walk gōd, at.
wall gy'īrī'
warm (re) t'a'
warrior g 'ān s'a'tē = fighting master
water hin
wave tīt.
we ohān, ohā'no
weak tlōtl wu til tsēn = not strong
west wind sā'naq
wet (tl) tl'ak
whale yār
whistle tō uq sirēt = into plow place.
white ru, tlēd yiq atē' – snow-like color
widow, widower, hitltsatsēcā'wat.
willow tc'āl
wind ky'ētlca'
wing kitc.
wing of nose tlōgūte.
winter tāk (see *year*).
to wish sigō', gācu'
wolf g ō'utc.
woman cā'wat.
—— *a man, who is in the habit of sleeping with women,* cā s'a'tē –. woman master.
woodpecker gan da da gūg' — wood around (– = bark) around pick.
worms tl'uk .
wrist djin t'ak tl

Y

to yawn aky ē't.
year tāk (see *winter*)
yellow kyētl ha'tlē yiq atē = dog excrement-like color
yes ā
yesterday tatga (see *night*)
—— *day before,* tatga tlīraaka't.
you riwā'n, riwā'ntc.
young ga'tsgō
—— *man* radia'k'
your ri (—ri)

II. ENGLISH-HAIDA.

Skidegate Dialect

(Note.—The words followed by a K. are Kaigani dialect.)

A.

above gi.
—— *it is,* ca ā'tsi.
to accompany g āk'ā'it
Acer tik ātlk (borrowed from Tlingit) K.
adam's apple k'aga'n sku'tsō = lung bone.
adze qot'a'
afternoon san tā'tsara gā'lsta.
again l'ana
alive qal'naāga.
all tlō'qan
Alnus kā'ac (borrowed from Tlingit) K.
always wa gye'na.
Anas boschas tha K.
—— *clypeata* ult.
—— *histrionica* k 'a'cg'utk
ancestor tlata dā tal'nga = long ago my grandfather
ankle gy'atl t'ama'l = leg knuckle.
another k a'irō
Anser tlgyitgū'n
antlers nacā'ārā.

antlers, many pronged, g'at g'oa'qa gig 'ā'ñral = deer's manifold antlers.
anus k'asē'
apparel, wearing, gya.
apron of woman digyitgyitigya (di t'ā'tsē)
apron for dances k 'antsētlqā'gya (gya = wearing apparel)
Arctostaphylus uva ursi dinq (borrowed from Tlingit) K
arm below elbow ɛl, ɛlā'l
—— *above elbow* ɛl tlɛl.
armor, wooden, for breast, talilkit
—— —— *for belly,* k 'antsētlqā'gya (see *apron*)
—— *made of sea lion skin,* k 'ōt l't (k 'ōt sea-lion)
armpits sk ɛl
Aruncus cordifolia ɛlt hauā'c
arrow, with bone or metal point, ts'ī'talɛñ
—— *blunt, for birds,* k 'u'ñgal
ashes dltɛ'tlqōt.
aunt (mother's sister) āo = mother.
—— (father's sister) sk āñ
aurora g ot qalga dā'ot'atl
axe gyētl daōō

B

baby k ā'qa (see *weak*)
back skuā'ē, gyl'ñguta.
—— *vertebra* gyl'ñguta sku'tso = backbone.
—— *of house* na stlɛñ = house back.
—— *of hand* sl'ō'na.
bad dā(sañga)
bald head skaqā'n.
ball, to play at, gūt kitl k'a'tsu
—— *played with seal meat,* qōt at gūt kitl k'a'tsu
bark of Tsuga ɛl, hā'l K.
—— *of other trees* k 'ō'tsē
basket, small, for berries, k 'ā'ltas.
—— *large, for berries,* k 'ē'gū
basket qin
bat k 'ātltsōqa'la.
baton of shaman t'ask '
beach gyitl
bear, black, tān
—— *grizzly,* qu'ots (borrowed from Tlingit)
—— *polar,* ha'l'un
beard sk 'ē'orē(n)
beaver ts'ɛñ
bed thēidā'n = sleep instrument.
beetle hanak ea'l K. = face dirt.
before this ku'nasta.
belly tātl
bell (dl)daɛā'wa K.
berry g ān(a), hān(a) K
—— *cranberries* djā'ē
—— *dried,* g an hi'l g ata
—— *boiled,* g an gala'naxl
birch atlā'rl (borrowed from Tlingit) K
bird qōt'ē't.
—— *a bird with red wings* s hā'lisel K
black (tl)k ātl, (s)k ātl.
black cod sk ñ
bladder k'ōg ɛ'n sk'an
blanket gyā'atk.
—— *Chilkat,* nā'xin (borrowed from Tlingit)
Blennius sp haol'n K
blood g ā'l
blue gō tirātl
blue jay tl'ɛ'njūt
body, the whole, tōñ'na.
to boil, gan, qoa'tlta.
boiled food gala'naxin
bone skū'tsē.
bow tlk ā'it.
bowstring tlk ā'it t'ā'tsē
box g ōta, dā'ota.
bracelet, copper, nalalgya'
brain k'ea'a'ntaxñ, k atla'nta'xñ
to break down qu'nduta.
the sea breaks (heavily) g'ā'lu g'u'ñgas (yū'an)

breast k·an
brothers and sisters k ·ā'tlqa.
brother tā (said by sister)
elder brother guā'l (said by brother)
younger brother dā'(ōrsa) (said by brother)
second brother gūctnañ k·atleqagua(?)
third brother gūct lā'na(?)
brother-in-law k cā'-- sister's husband (said by man)
—— tlx'nara - sister's husband (said by sister)
Bubo Virginianus gutgunē'st K.
Buccinum ckasak' K.
bucket g ā'na.
bush tlkyi'n(ra)
butterfly stlak·a'm.
buttocks k·'atltsō
button blanket guñ la'ñgō gyā'sik
by and by k'uā'l

C

calf of leg gy'ātl k ā'u = leg muscle
Caltha palustris sñ gitlsgañ - medicine above swim
canoe tlō'u
Cardium Nutalli cbilhlē'l K
cat tō'us (Chinook)
cedar, yellow, c hatlā'n K
—— —— *young,* ts'ō gyit ē
—— *blanket* lā'nlal.
—— *bark, used for making mats,* gyiē't.
cedar root dlē'iñ
Ceryle Halcyon k'ut'u'n K
cheek, lower part of, ts'i'ts.
—— *upper part of,* k·'a'n ts'i'ts.
chief (ora)ētlqagida'
—— *head-chief,* lā'na ā'ora = town mother.
child gyit'(ā)
chin tlkā'ā.
Chiton tunicata c.hā'lt K
—— *Stelleri* t'a.

Circus Hudsonica dō.hatlāga' K. = catching bird(?)
cirrostratus k uē'au
cirrus lā'n tsē'tla (ā'n = cloud)
clams skā'ē, ky'ū
clothing, to wash —, tāda'n tsl'gylda.
cloud lān
coat djit'l'akū.
red cod sk·ān
small codfish slā'ātsē
large codfish skā'ēnan.
cold qui'
colored tlrātl.
—— *many,* sqā'l tlrā'tls.
Colymbus glacialis tatl.
come! (used with the imperative) hā'la !
the winter is coming tā'da g l'lga
cone of pine ctl'ack'x'mal
to cook by means of heated stones sītl, gya'galañ
copper plate t'ā'ō
cormorant ky'ā'lan
cotton wood tl'al
Cottus sp. k 'āl
—— —— tl ā'ma
cousin sk āñ = father's sister's and mother's brother's daughter
—— uaqu'ñ = mother's brother's child.
—— lxra'n = father's sister s and mother's brother's son
Mother's sister's child = brother.
Father's brother's son = brother Elder or younger brother are used according as cousin is elder or younger than self
crab k 'uct'ā'n.
crabapple k ō'lq
—— *tree* k ō'yintl
cranberry ts
crane, and Gallinago Wilsoni, dal (borrowed from Tlingit) K.
crazy dladlgus (see *land otter*).

crow k'ā'ltsnda.
crown of head tl'ʁl k·ā'tsō.
to cry sk ā'yōtl.
to cut off (neck) (qil)k 'ē'tl.

D

dagger k 'ā'otl
to dance nlā'tl
(shaman's) dance (sk ā'g·at) wikatsō.
dancing leggins gy'ātl gya — leg dancing ornament.
danger at sea e hā'noskʁn K.
daughter-in-law dʁu ōnā'n.
dawn sʁn gillañga (nō'kus)
day sʁn.
—— *all day long* sʁn sg ā'sg ō.
it is daylight k ā'dēga.
dead g ōt'utl
deer g·'at
Delphinus Orca sk ā'g·a, obān K. (see *shaman*)
dish k·ā'tla = wide open
—— *carved on both sides* k ā'tla k ō'la = dish forehead
dog qa.
dog fish k 'ā'qata
dog salmon ok'ʁk
doll gyit, gʁdē's (children's language)
dolphin sk ul, k 'āñ
door gy'ū ; stʁñ
—— *in heraldic column* gy'ū qa'l — door hole.
down (feathers) tʁ'nrō, g ʁ'nrō
dragon fly dē'gua t ā'mā'l — sun louse K., mā'mats'ikyō (borrowed from Tsimshian)
to drink qutl.
drum gā'udjau
dry g 'ā'(ga)
duck qā'qa.
dusk aga'lgua.
dust, dirt, sk·ea'l.

E.

eagle g ōt, hōt K
eagle black hōt tlrātl K.
eagle gens gyitans'(c)
ear gyū
opening of ear k·ā'tlō
earth, ground, k 'ul' (see *island*), tlga.
earthquake tlga l'ldʁñ.
east wind k 's'ratsg a.
to eat ta.
to eat together uā'ras.
ebb tide gyiltraul'tl.
edge of box olañ
upper edge of blanket al'da
egg k·ā'u
lice eggs djāc
elbow nl taxgui' (nl — arm).
elk tci'cku
Empetrum nigrum hackā'wa.
to enter k·adl (see *to walk*)
ermine tlʁk, tlqa.
evening sʁn sl
excrements k u ā'rau.
eye qa'ñg(ē)
eyebrow sklā'tsō
eyelashes qa'ñga dlt'a gutcō
eyelid qa'ñga g ā'al = eyelid.

F

face qañg(a)
fall trā'nut k·arat (see *winter*)
to fall over k 'ā.
to fall from ōsg oē'
far dzīñ ra.
fat tlk ō'na
father (said by man) k uñ.
—— (said by woman) qāt.
father-in-law k·ō'nō (see *son-in-law*).
fathom ʁl rōdlagi't (ul = arm)
—— *half,* dl ky'ē'ōrā dlōg'ē'ta = my median line of body fathom
—— (measure from left shoulder to top of finger of right hand) sk al dlō (sk·al — shoulder).

feathers, pubic, g·ā'u

female sexual organs kā'u ; tsō'u (children's language).

a certain festival gyā'lot.

—— —— gag'uō'ta.

to fight rā'gitla.

—— *together* gūtg·an ıā'gitla.

figure k·'ōda.

finger al k 'a'ñō = hand finger.

—— *first,* all k'uā'na (all = hand)

—— *second,* yak 'olā'na.

—— *third,* qōlgā'us - weak.

—— *fourth,* all gō'uts (all = hand)

fire-drill tlklā'k'ē

fireplace k·aō'qōt.

firewood ts'ā'nō

fish tcitl

—— *fresh-water,* tc'ō'na.

—— *salt-water,* sk 'ā'tlan

fish knife tā'g·atsō

fish line of kelp, tigal.

fish otter ts'ōwu'lek'

fish roe tcā'ō

fish trap, bottle shaped, sk'aıā'ō

fish trap, large, gyī'rau

flat g·a.

flesh gyē'ri'

fleshy gyēıā'uigō'u

flood tide gā'otiluit.

fly dō'ldzn.

fog lā'n(nñga)

food ga ta'

foot st'ā'ō

footprint st'a sel

forehead k·ul

forenoon sangā ē

fox naga'tsē (borrowed from Tlingit)

frame tlk·a.

my friend ta'quā.

frost g alz'ñgudatl.

to fry cltl.

—— *on stones* cltl g uta' = fry stone.

Fucus vesiculosus t'al (borrowed from Tlingit) K.

fur seal k·'oā'n.

G

gambling sticks san

to give ō'lsta.

to go k a, i'sk·us, gand'aul't (?)

let us go hā'la d'ā'laū gand'aul't s'aū.

good lā.

grandchild t'agyz'n

grandfather tcin.

grandmother nān

grass k 'an

gravel sqat'z'ldaū

green gan tlratl = yellow ; g ōtlratl = blue.

greenstone (jadeite) dlk·ā tlō'u.

gull ck 'in.

gums ts'zū k·'ul - teeth skin

gun dzī'gū.

Gyins hā'noa (the wife of Nenkyilstlas)

H.

Haida qā'eda.

hair k·as k 'ā'tl = head hair

—— *dress of shaman* gylōtl

half yā'kō

—— *moon* k uū gōnzroā'ō

halibut qā'kō, hāk' K

halloh! al'dīñga !

hand sll, slā'ō

Harelda glacialis ā'ñg·ñgō.

harpoon k 'ā

—— *line* k 'ā tl ā'tsō

point of salmon harpoon k'udz'nkyll.

hat dā'dzū

—— *ring* dā'dzrū skl'lga.

he la.

head k 'ā'tsē

—— *ring of red cedar bark* tlzntlgyl-k s'lda.

to hear gū'dzū.

heart tōk'ō'gō.

her la.

heels st'a kōsō' (st'a = foot)

to help etlwa
heraldic column gyā'raā = standing upright
herring i'naā
it is high water skuā'ga (rilgua)
hips k ātlu'l skū'ts ō (skū'tsō — bone).
hook, for fishing halibut, tā'ō
iron hook stil tā'ō
hole qal
hoof of deer g 'āt st'ā'gun (st'a = foot)
horizon k nēudzl'nrau
horn (see *antlers*)
horse gyūdā'n (Chinook)
house na
—— *dug out part in centre of,* dā'a.
—— *front* na quā house face
humming bird quktgyiā' (borrowed from Tlingit) K
hungry k 'uō'ta
husband tlāl

I.

I dā(a), tlā'(a).
ice g al(ga)
indeed? ōdja?
Indian of the interior ta ak'a.
inside k ā'tlēk, nā'guat K
instrument tan
interstices between fingers sll stk asā'
intestines k'ūs.
invitation to autumnal festival la'gyinem
iron ire'ts
island guā'ē

K

K atlanak u'n, name of a place.
kelp tlk'sā'ma
—— *cake* qā'eda gu'ira — Haida tobacco
kettle ek 'al
—— *wooden boiler,* ek'al gan
—— *wooden,* tā'utaqal; ak'a'lgal

kidney tcā'ō.
to kill tō'aqan.
knee k 'ulō'
—— *pan* k 'ulō k-ataā
—— *joint* gyal k uld'a'āgō = leg joint
knife sqā'u.
—— *made of shell* taqā'ō
to know u'nsēda.
I do not know ā'ya.
knuckle d'ama'l
Kushtaka (otter people) gagyil'l't K

L.

lake sū
Lā'nas = the town, place near Rose Point
lance tcea'tl.
land tlga
land otter sdlgū
large yū'an
to laugh k'ā.
leaf dlk 'a'āgual.
Ledum palustre hl'lk-agen K. = mouse neck.
left hand slā'nāgi slā'ē
leg, above knee, thll
—— *below knee,* gy'ātl
dancing leggins gy'ā'tlgya = leg wearing apparel
leg of table tlga
lid of box tā'nta k ā'al = box lid
to lie k 'ōnt, kutlaidā'n
liar k 'ōnt lnā'era = lie master.
lightning sqēt g āuldaā
to like stat'a'l
Lina sp. djuwēt'amā'ō
line tl ā'tsō.
lip, upper, h'ō'tsēqun.
—— *lower,* k'ō'nta.
liver tātl'alkul.
lobe of ear gyū st'ā'ō = ear foot.
long ak'a, dzlā
—— *ago* tlsta.
loose cuvā'o.

lost gā'u
louse t'am.
low water tsā'qoa.
lungs k ā'gonskō'ga (see *adam's apple*)
Lupinus ga'ndō
Lycopodium clavatum g 'at didagā'-wa = deer belt.
lynx tigyan dā'udjā'ē (tigyan = forest)

M

to make da, gyilā, g ōtira.
man ē tiliña, k 'al
—— ga, for instance, k''ā'la ga = raven gens man
many akō'l (only referring to men)
—— k'ā'n (referring to any thing including men).
—— yū'an (referring to any thing including men)
martin k 'ō'u
mask nitxa'ñgō
master irā'em.
mat igūc
meat gyērl',
median line of body ky'ō'rē
medicine nil
midnight g al yā'kō
mind gū'dañ.
mine tōnx'ñxa, nā'ra.
moccasin st ā tik'u'nkyē (st'ā = foot)
moon k 'uñ.
—— *new*, k 'uñ ihal'lōgan.
—— *first crescent*, k 'uñ k ōqatiga = the moon opens his eyes.
—— *last crescent*, k 'uñ ihallōda'l-gan
—— *begins to be full* k 'uñ g'aisgō-gi'iga.
—— *is shining* k 'uñdian
more l'anñ.
morning san sō'qan.
mortar dā'rō.
mosquito ta'era'ltaquan.
mother ā'ō.
mother-in-law dxīrōnā'n (see *daughter-in-law*)
mountain t'e'is, tidōiā'u
—— *goat* ky'i'ñrē.
—— *sheep* mat' (borrowed from Tsimshian)
mouse ka'gan
—— taigul ā'ora (ā'ora = mother)
mouth qōtl'ē'
mud tcān
muscle k'ā'u.
Mytilus edulis hal K.

N

Na ēku'n, Rose Point.
nail sli g'u'n = hand nail
naked k oonā'nō
nape ta'e'kyō
navel agil
near ā'qan
neck qil.
needle sin.
nephew (man calls his sister's child) nāl.
—— (man calls his brother's child) gyit.
—— (woman calls her brother's child) tsqu'ñ
—— (woman calls her sister's child) gyit
net a'qat.
night g āl
—— *it is*, g ā'iga.
nipples tl'a'nwal
no gañ'anō
Nootkan qālēta'
noon san tā'taera.
north wind k 'āunstē' ga, qu'stegu
nose kun
nostril kuntsqui
not gam.
notch of arrow stiqu' tsō
now (a)āwia't.

O

oak tcā'nañ
oar ādl dzī'ndia = paddle long
ocean si.
œsophagus tl'xīqō'ts'xl
Oidemia perspicillata c'i'ndatl K.
Oidemia sp gā'oq K.
olachen cā'u
old k·'ā'i
—— *clothing* k 'u'lzu
—— *man* nxn k 'ā'la.
on gūd
—— *top of* u'nsī, gī
one squn, sqa'sgō, squā'nsañ
open k a.
to open one's eyes k ā'qatlg a.
another one gyina k 'a'lrō
outside hadō-l K
owl, white, k'ñk' (borrowed from Tlingit) K

P

paddle ādl
to paint k'ōtlā'nō
red paint for face (quñ) mā'tsa.
black paint for face (quñ) k 'ā'tsa
palate sē'iñgatsē
palm of hand sil k·ā'rān (sil = hand).
Parmelia k'āltsīēlō'dja.
partridge, ptarmigan, ck ā'u
Parus tatlidā'argyēt
penis tsi'tsī
people qā'ēdqa.
perforation of nose kun qal = nose hole
—— *of ear* gyū qal = ear hole.
pestle dā'raō, dā'raō ts'xñ
petticoat cā'ata lgyēgyiā'qa = woman's petticoat.
pile of fuel ts'ā'nō sqa.
pillar, erected in commemoration of deceased, qāt
pipe qō'tlxñ g·ā'eudā'ō = mouth smoke box
to piss tsō'gxñ
plant of foot st'a k·ara'n (st'a = foot).
poker kyitsqala'ñgō.
Polygonatum ct'ā'u hā'na = witchcraft berry
porcupine hatlgats (borrowed from Tlingit) K.
porpoise sk ul
to possess (tla) da, k ē'l, (tlē) ran
post, in house, k ōtg a'ñgō.
potlatch wā'tlqatl.
pregnant, she is, l tātl gyit'ē' (gyit'ē' = child, l tātl — her belly).
puffin k ōqx'n, k oana' K.
pupil of eye qa'ñgē l tān karē'l

Q.

Qola g a'ndla = Raven water, a river on Queen Charlotte Islands.
quartz tlk a k 'ā'tsē (tlk'a = stone)
quiver ts'itals'ā darā'ō = arrow box.

R.

rafter ts'ān sk'ā'gāl.
rain dādl.
rainbow tā'wal.
rain wind (generally east) qē'u.
raspberry hān gyit'ē' = berry small.
rattle, raven, sisa'.
—— *shaman's,* dikum hitaga'ñgō
—— *puffin beak's,* tlm hitaga'ñgō
—— *skull-shaped,* k 'ōl hitaga'ñgō
raven qola', yētl (borrowed from Tlingit) K
—— *gens* k 'oā'la(e)
to recover from sickness ñgā'istl, lgila.
red sqēt.
reed k 'ān tl'akida' = grass wide.
rib qē'wē
Ribes hā'iwa (borrowed from Tlingit) K.; k 'ōtguā'n K.

ridge of house, formed by a long board, tīgī'tlal.
—— *of upper part of ear* gyа tlk un = ear ridge.
—— *of nose* kun tlk un = nose ridge.
right, it is all right, tᴇ'mqᴇn.
—— *hand* sqōlgyllā'nā.
river k ā'ura.
to roast fish dlgū
roof na ū'na = top of house
—— *inside of,* na k arā'n
rope of spruce roots k u'ntla.
—— *of cedarbark* k·oa'ē
—— *around food box* tāut iya'ñgrē
rotten s ā'ga, gu'ᴇraga.
round g ā·a, g ō (see *full moon*)
Rubus Vaccinium uliginosum, han hā'ulas = berry sweet.
to run k ā'ᴇlt

S

saliva tl'an
salmon tciu
—— *a small species,* o·boā'gank K.
—— *hooknose,* tāl
—— *humpback,* ts'lt'ā'n
—— *white,* tā'un
—— *smoke-house for,* tā'ua nā'l
—— *weir,* ᴇlā'l (the centre occupied by the fish trap *gyīraa*)
—— *berry* sk ā'uran
salt tā'ñga g ā'ga = dry sea.
sand tās.
Saxidromus squalidus ky'ū.
scalp k ās'ᴇ'l
scared tlquā'k a.
scraper of deer bone gyltᴇrᴇtō'skō
scrotum k 'utlō k 'al = testicle skin.
sea tā'ñga.
—— *far out into the,* slakō
seal qōt (borrowed from Tsimshian)
sea lion k·ūt, k·āē
—— *hat* sqā'tsō dadᴇkñ
—— *armor made of the skin of,* k 'ōg·agya'.
sea otter k ō'u ((?) see *martin*)
to see k īñ, k·ea'ñ
self tlōo, ā'gᴇn
septum kun tᴇ'ñgarē
to sew tl'ᴇl, gya tl'ᴇl
shaman sk ā'g a.
shark k 'āt, k 'ā'qata ā'ora dog-fish mother
she la.
sheath of dagger k 'āotl k 'al = dagger skin
shells, burned and chewed with tobacco, guā'ga.
ship k 'ē'l
short k 'ōdrā'ō
shoulder sk al
sick st'ō.
sinew qā'ē
to sing sqalā'ñ, k'atsā'ō.
sister, djās (said by brother)
sister-in-law tlᴇ'nara (brother's wife, said by brother and *vice versa*)
—— tsi'ñga (brother's wife, said by sister and *vice versa*).
to sit k 'aū'ō
skate sqā'na.
skin k 'al
skull k a skū'tse = head bone.
sky k olē' k arā'n
slate tlk a s'ā'ga = stone rotten (soft)
slave qaldᴇ'ñga.
to sleep t'ēl
sleep tlk 'ag a.
sling tᴇswu'ñ
small gāu gᴇ'tsō
to smell sku'ngudᴇñ
smoke g ā'ēu, gyiᴇ'lt.
—— *hole* gylnadā'l
snail ct'ᴇ'la K.
snake sl'ga.
snipe syabī'a.
snow d'arā'ō
son-in-law k ō'uē
soot k·ayū'clan
soul catcher k 'angiltlkigya = breast dancing ornament.

berry soup an.
to speak kyē'tlkul
— *to somebody* sō'ta
spear shaft kit'ū'
to throw spear kit.
sparrow hawk skyā'makun
Spermophylus Parryi tsatlk'
spider k 'ulstā'ñ
spike of pine glā'
spoon slā'gul
large spoon slā'gul g'anlā'lō, slā'gul g'anx'l
spring k 'ln rud, k 'ln ru'da (k 'ln = summer)
sprout ck 'ā'n *K*
squall t'ā'tsō k ōē'wō (t'ā'tsō = wind)
squid nū *K*
squirrel da'sqa, gatltsā'k *K*
to squirt yl'ltxñ
to stand gyā'mñ
star k 'ā'ltsāo
shooting star k 'ā'ltsāo kwā'rau = star excrement.
starfish sk 'ā'um
to steal k 'ō'tlta
stomach gy'ē'tsn
stone tik a, g ōta'
storehouse in forest gya'o balā'ñ
storm qastl
story k 'ā'ng añ
strawberry bil dābā'ñ
street gy'ū.
strings for tying up blanket, handle, (dl)t ā'ts(e)
strong dakuya'
stump of tree, a fallen trunk, k 'ā'qō
summer k 'ln, k 'ln yā'kō
sun dzidlg oā
suspensor of dagger k 'ā'otl t'ā'ts.
swan tltl'u'n
sweet hā'ulas.
sweetheart k 'atal'ra.
to swim (bird, wood) tlagx'ñ

T

table gata dā'n = it eat instrument.
tail of bird, whale, ky'ī'ta, sky'ēā'ō
— *of fish* st'ā'l = foot
to talk kyētlkul
talker kyētlkul lrā'era = talking master
tattooing gykla'
temples near eyebrow skya'ts qōta.
— — *tragus* gye'lsantā'rē
testicles k 'utlē'
there ēa'.
therefore k 'a'gan
thicket tlkyan ta'lga'nga yū'an.
thief k ōtlta lrā'era = steal master
thing gyl'na.
thirsty k 'ādō
thorn dā'a, dā'ñga
thread gy'etlā'ō
to throw with stones tsā wa'ñga (see *sling*)
thumb stl k'uso'
thunder hē'lañ, kaqē'gal
tide koā'kla'
the tide turns koa'tlk at ltā'ra.
Tlk āgilt - *Stone beach;* Skidegate.
toad tlkyan k'ōst'ān = forest crab
tobacco gul
toes st'ā k 'a'ñgē - foot finger
to morrow dā'rgatl
tongue t'ā'ñgal
tongs, for taking stones out of fire, tlk a tsō = stone tongues.
too g ē'dañ
tooth da'xñ
molar tooth da'xñ k ā'tak ul
town lā'na.
tree k ēt k'ā'ē.
trout tā'tl'at.
twice stlñgxn
twins ntsā'ta qē'ga stlñ

U

Ulea k 'āto.
uncle (father's brother) k'uñ = father

uncle (mother's brother) k·ā
unmarried man diulān
—— *woman* ak'nā k e'nda.

V

Vaccinium ovalifolium tlīān
—— *Vitis Idaea* ak ā'uran gyīt'ē' = salmon berry small
valley tl'ā'dan
vein g ā'l nag eré' blood vein
Veratrum guā'lga K
Viburnum acerifolium tlā'ō K

W

to walk k a
wall na ta gul = house side.
warm ky'ē'lan
warp qā'l
warrior gutl'l'sta
—— rā'nitla lrā'era = fighting master
to wash tlā
—— *one's hands* sitlā'nxā
wasp sral, o hal K
water g andl
wave g ā'ōu
we ell, t'ala'āgua
weak k āqa(ga')
weft k 'ōdā'l
wet radzi'gaā
whale kūn.
—— *fabulous, with five fins,* wāsk
what gōsn, gōg'ne.
where gyinō'.
whistle sk ā'na
white g 'ā'da
—— *man* lrē'ta qā'ētra iron man
—— —— k 'zl g adā'a = man white
who gyī'sio
why go'guag anō, g ā'tlantlā'ō
wide tlak ld '
wife dj'ā.
wind tāuā'ō
—— *seaward,* tatsā'ū ag a
—— *outpaw,* tatsā'ō ak ada'lga
—— *landward,* tatsā'ōgitl
—— *increasing in strength* t'atsō'lga
wing xu'l, st'ā'rūn
winter tā'da, ahā gā'rat
to wish sīā'tal
witchcraft st'ā'u K
wolf gō'uto, hō'uto (borrowed from Tlingit) K
woman dj'ā'ata
woodpecker clōtag adā'ā
wood tlkyān
worm clk, ak ā'ra
wrist nāē k 'ōld'x'āgō arm joint

Y

year tā'da (see *winter*)
yellow g'an tlratl
yes ā, ō, ā'āga
yesterday dā'rgal ilgā'ō
day before yesterday sta g al stiā ga'lgen = two nights ago
you, pl. dala'ā
young gyī'ig ō, lta'rxn

III. ENGLISH-TSIMSHIAN

A.

above lxqa'
to accompany stōl.
across taag'a'.
adam's apple sīā'uq.
adze of stone taaxr xm lāp = adze of stone.
to adopt sxwulā'hk = make relative
afraid baa, *pl.* lebaa.
afternoon tla dā'utl gyā'muk.

again tla(1)gylk(2) = perfect sense (1) then (2)
against tqal.
—— (*hostile*) lebi'lt
ago, a few days, g'a'rdats.
—— *a few weeks,* gyetqā'utq
—— *a year, long ago,* gye k'ā'otl (k'ā'otl = year)
—— *long,* tlā'gylgyat.
air ba.
all tqa'nē
to allow anāoq (see *to consent*)
I allow him to come naā'yō dam k ā'ēdaka.
also dl.
always tlā'wula.
ancestor, female, nag an tsē'esk um. (see *grandmother*)
—— *male,* nag'an yētk'um (see *grandfather*).
and (connecting nouns, etc.) dltl, g antl
—— (before words designating human beings) dis, g'ana.
—— (connecting sentences) ada.
angry tlō'ontē
animal lē'ts'ask
ankle haaho'm
to answer dilamaqtl
antlers qaqā'na.
arm aa'o'n
—— *above elbow* lubao'n
armor of elk skin k 'atlā'n
to arrive batsk.
arrow hāuā'l
—— *bird arrow,* t'ō'ea.
to ascend a river g 'a'la.
to ascend a mountain maqtl
ashes ōa'nak sak
ashore tsa'ran
to ask kara'tsq.
Asuwā'lgyat (a fabulous monster belonging to the gens K'anha'da, *raven*) gyat = person
at (referring to distant objects) ga, gaaga

at (referring to present objects) da.
aunt (mother's sister) = mother
—— (mother's brother's wife) nakt'ā'.
—— (father's brother's wife) nā'ea.
autumn ksō'ot.
axe, European, gyōgyā'otk = lengthwise fastened.
—— *stone,* daba'ras.

B

baby, male, gyluē'ea.
—— *female,* wuk 'ā'uts = without labret.
back k 'ā'o
backward gyl'laks.
bad hada'q
to bail ts'ō'yuk
bailer ha(1)ts'ō'yuksa(2) = instrument (1) bailing (2)
bark, match, gylmat.
basket, for berries, lū'eal
—— *for fish,* tasth'.
—— *of cedarbark, for carrying household goods when traveling,* dō'ulk.
to be nē, nēnē'
bear, black, o'l.
—— *grizzly,* madī'ek.
—— *fabulous (?) white,* maa'o'l.
—— *gens,* gylapotuwa'da.
beard ēmq
to beat time k'aasp'a'
beaver sts'āl
because (a)wul
bed halēlā'tlk
bee ap (borrowed from Tinne).
beforehand gu'ldam.
behold! raksiaanā' !
belly ban
to belong to wāld
below gyēsk.
berries, dried, gunē'gu (atl)
Bilqula Lalgyimē'l.
bird ts'ō'wots.

bird, all flying animals, lapā'yeky
black t'ō'otsk.
—— *paint for face* qtō'ots.
blackberries mā'e.
blanket gus
—— *white*, gus māks.
—— *sea otter*, gus ptlōn
—— *Chilcat*, gus(1)nalkyi'm(2) gyā'muk(3) = blanket (1) sun (3), nalkyim, evidently from na'qin, Tlingit.
blind sû'ɛna.
blood itlē'
blue kuskus'sk.
boards in bottom of canoe ktsā'uks
bone sā'yup.
book ɛā'wuns.
boom t'ukaitlē'
boots ts'ā'oqs (see *foot*)
on both sides laquq.
bow hānkts'k
—— *of canoe* gyits'ā'lq
bowstring tē'es.
box for food k alɛi'rɛnk
—— *for blankets* qpe'ls.
boy wōmtlk.
brain wunɛg ā'us (see *head*)
branch anō'ls, *pl.* ananō'ls.
—— *of river* lōts'ār
—— —— ts'ā'tlē
bread anā'ē
breast k·ā'yek
breath kamnātlk.
bridge tamja(1)k·anē'qs = across (1)
to bring da k ā'edzks (da—at, k ā'edzks = to come)
broom had'ō'osk = instrument sweeping.
brother (called by brother) weky
—— (called by sister) tlɛ'mktē
brother-in-law (husband's brother) tlg ɛgā'otks.
—— (wife's brother) tlg nag·atlā'm.
brown ɛrloqlā'p (see *stone*).
bucket ō'mtlɛlt.
bullhead (a fish) g·'ayē'et.
burial of shaman in house or cave ts'ɛm lāp = in rock.
burning the dead mālk.
—— —— *payment for*, qmālg'ɛck = receive for being burned.
to burn (v. n.) gus lak (see *fire*)
—— *burning leggings*, Gualgaba'qs (traditional name)
to bury lō ɛn'o'n = into hand.
bush species (?) qtlātl.
by and by hāuwē'nē
—— tladzɛ

C

calf of leg hā'ɛnɛr
to call hō'otk, *pl.* hukhō'otk.
—— *I call his name*, nēuwā'tkads (see *name*).
calm gyaka.
to camp gyā.
to move camp lāyek.
cane, walking, k ā'at
cannibal qɛyut = eat people (Olala)
canoe qsā.
Haida canoe qsā ɛm Haida.
canoe moves stern foremost lāntk.
cañon ts'alā'aɛr
cape k·ā'maks.
carriage ts'e'ktslk (Chinook)
to carry into ts'ɛlɛ'm(1)ga(2) = into (1) at (2)
—— *in flying* tlkyepā'lk (see *to fly*)
to carve gyetlk, *pl.* gyetlgyetlk
carving knife hagyetla' — instrument carving
cat tō'us (Chinook)
to catch salmon spaqtl
causative — ɛn.
—— — g·an.
cataract ts'ɛm(1)hō'otseq(2) = in (1) ? (2)
cedar g·alā'r, *pl.* g ɛlā'r
—— *bark* hat'ā'l
a certain g'ālt.
chair hali'd'a (d'a — to sit, ha = instrument).

channel, narrow strait, mʀ'qtls
cheek, lower part, wundā'
—— *upper part,* teā'L
cherry g 'ʀlā'mst
to chew k 'ā'un.
chief sʀm'ā'ylt.
child tlguā'mʀlk, *pl.* k'spʀtgʀrʀtlk
—— *of chief* tlguwā'lksek
chin tqlskwak (kwaq = lip)
clams ts'āq
to close one's eyes ts'ē'ep.
cloud, overcast sky, sa
—— *cirrus,* wukts'ʀ'n
club, war-club, k·auwā'l
coat kōtā'n.
cold, to feel, qkua'tko.
to come k·ā'edʀks.
—— *from* wātk, *pl.* smlā'an (see *from*)
—— *down* kwānt
common things skstg ʀm gā
company nā'tsil, *pl.* natā'tltatl
to consent ʀnā'oq
to continue tlāwuls wāl always do
—— tlāwuls hāu —always say
copper plate haya'tsk
cormorant k ag ā'
corner amō'
—— *of house* amo's.
council lʀsā'osk, wulg ak ā'st.
—— *combined with feast* g'ʀlʀgā'-yqtl
councilman (next to chief in rank) lʀgagī'gyat (gyat = person)
country k a'lts'spt (see *town*).
cover of anything āt.
cow mʀsmō'os (Chinook)
crab k ʀlmā's.
crabapple mālkst.
crane k 'asqā'os.
crest (of gens) ts'spk (see *town, people*)
crow k 'auqā'n
crown of head mʀsʀmā'
to cry wihā'nt = great say, *pl.* bāk
—— *for sorrow* t'ā'oqtlk ʀm bāk.
cup haa'ks = drink instrument

to cut k 'ōts, *pl.* k·'sak 'ōts.
to cut off qtsak·ā'ts.
to cut open pē'stl

D.

day sa (see *cloud*).
dagger k 'ad ʀm dō'osk
dance halā'lt.
dancing blanket gus halā'lt.
—— *hat* amhalā'lt = used in dance.
—— *leggings* k·aqselks ʀm si (si = leg)
daughter = female child.
dead ts'ak.
deaf ts'a'eq
my dear! (*male*) nād
—— (*female*) dātl
deep tlʀp
deer wan, *pl.* wan
—— *fawn* kusts'ō'ek.
to die ts'ak, *pl.* dʀr.
dish, carved, k·al'ltl.
—— —— *large,* k alltlē'ek
—— *of mountain sheep horn* stats's.
to do wāld
dog has, *pl.* hasha's.
door lʀksā'q (see *out*)
double gu'lbu.
downward tgye
—— ya'g a.
down a river gi'st
dreadful hats ʀ'ks (see *ugly*)
to dream ksuwʀ'q
to dress up nō'otk, *pl.* k'anō'otk.
to drink aks, *pl.* laa'ks.
drum nā'otl
to dry (v. a.) sigʀ'r
duck mō'ʀk
—— nanā'ut.
—— *black,* amgyī'ek
—— *spotted,* g ag·awē'.
dust yō'op

E.

eagle qskī'yek.
ear mō

earhole ts'ɛm mō = in ear
perforation of ear nak·aga mō.
east gislya'sk (gi'si = down river)
easy é'ɛpɛn
to eat yā'wiqk, *pl.* tqā'oqk.
—— *in compounds,* q—
—— *something* gap.
—— *up* tsātlt.
egg ligɛma't.
elbow sk ā'nēls.
(*person*) *elder than self* sē'elgyat (gyat = person)
elderberry bush sk·an lā'ots (k an = tree, lā'ots = elderberry)
elderberry lā'ots.
elk sīā'n
to elope da (see *with*)
to enter ts'ē'en, *pl.* lam ts'aq
European k 'amksī'os (borrowed from Heiltsuk ?)
evening skī'yotlaks.
eye wul'ɛ'l
eyebrow lɛgyī'l
eyelashes nā'mɛl.
eyelid, lower, sk ā'ul
—— *upper,* lɛqaā'l

F

face ts'al, *pl.* k·ats'altsa'l
to fall k ā'ma, *pl.* lō'lma. sa(1) k ā' ln(2) = suddenly(1) to fall(2)
far t'a, *pl.* t'ad'a'
—— waralt'a'
to fasten daō'ep.
—— *to dae'ep* tqal (= against)
fat (n.) yā'l
father nɛguā't.
—— *address,* ā'bō
father-in-law tlāma.
fathom g ā'lt.
—— *half fathom* k 'ā'yek = breast
—— (left elbow to tip of finger of right hand) disk·a'nēls (see *elbow*)
fear haat.

feathers ll
to fell (a tree) k 'ōtatl (k·an)
female (only referring to human beings) kɛɛm—.
few abō'o
to fight wuldō'yitk.
—— *with fists* dal
fin of fish nɛk suwā'l (see *paddle*)
—— *Delphinus Orca* nē'iq.
to find, to reach, to receive, wa
finger kuts'ō'atl
—— *first,* hats'ē'ek
—— *second,* ksin'ā'k
—— *third,* hastā'leks.
—— *fourth,* tlgō'uskal
to finish g ā'ōdē, g·ag ā'ōdē.
fire lak
—— *is burning* gua'lak
—— *to start fire* sɛgua'lga lak (sɛ = to make)
fire drill tkī'en
—— —— *stick of,* nɛ sī'ētkī'en = foot of fire drill
fireplace ts'ɛm la'k = in fire
fish lōwɛ'lɛm(1)ts'ɛm(2)aks(3) = in(2) water(3)
fish hook t'ō'wil
flag (*European*) atlo'm(1)gyamuk (2) = sail(1) sun(2)
flanks sitlk
flat tga, *pl.* d'aqtqa
Flatheads d'aqtqa = the flat ones
flounder daqs.
flower mɛtsaqalā'l
to fly kyɛpā'ek.
fog yē'en
to follow yā'ak
food wunē'la.
foolish mɛwa'tsa (wa'tsa = land otter).
foot si (Nass: sā'ē) tsā'oqs (see *plant*).
forehead wāpq
forenoon serliaqs
fork hayā'wiqk = instrument eat
fox saratsē' (borrowed)

friend nᴇsō'banak.
frightened baa.
fringes on upper part of blanket for tying it t'ā.
fringes on pants, etc., batlā'
from wātk (see *to take from*)
fruit, species(?) kai'n

G

gambling with sticks qaᴇn
— *sticks* qaᴇn sā'yup gambling bone.
— — *the trumps, sticks without marks*, g ā'ē
— — *marked with three rings* kai, taᴇrda'm
— — *marked with three rings, the central one broken at one side*, k 'o'daiqt.
(*to gamble with sticks*) · *shuffling and dealing out*, sā'ritsō
— — — *to choose one stick*, gū'aᴇn
gens piēq
to get a "douceur" gylā'lq
ghost bā'laq. *pl.* bilbā'laq
gills k 'ā'uaq
girl tlgua hanā'aq = little woman; wōk 'ā'uls = without labret.
to give gyᴇnā'm, *pl.* gyengyenā'm.
— *food* gyī'ᴇn.
glabella lō spᴇq lᴇgyī'l (lᴇgyī'l = eyebrow)
glacier s'īā'n
glad lō(1)ama(2)k ā'ot(3) = in(1) good(2)heart(3), *pl.* lō amā'm k ak·ā'ot.
to go k ā.
— *go!* ndā! *pl.* ndā'aᴇm
to go into a boat lō'k·ᴇm (lō = into)
— *on a road* yāk, *pl.* liyā'k (see *to follow*)
— *out of house* kaᴇr = out.
god sᴇmā'yit kᴇ laqa' = chief above
good ām, *pl.* amā'm.

goose, black, bā'aq
— *white*, tlē'wun.
grandchild tluktā'ayen
grandfather niya'.
grandmother nia'e'etsō
grass kᴇyā'qt
great wī, *pl* wud'a'.
great grandchild ō'olla.
great grandfather ō'olla.
grease of olachen k 'ā'watsō
grease bag of sea-lion guts sinok-sā'ak
green mᴇtlē'lik
greenstone nᴇbā'n
grouse maqmō'eq
to guess gō (see *to shoot*)
gull k ak ō'um
gum for chewing akyan
gun k ap'ᴇla'
guts k al'ā'ou.

H

Haida Halda
hail ts'ats'a'
hair lī.
— *of scalp* k ā'us (see *head*)
half qpī'yē
— *while* qpīmā'k.
— *cuttlefish (a crest)* qpīhatsalt.
halibut tqā'ō
— *hook* yīg a'
haliotis pᴇlha'
hammer, stone, tᴇqtl.
hand an'o'n
— *back of*, lᴇqsᴇnē'itl.
handle of paddle g ā'lon
to hang yaq, *pl.* yā'laq.
happy lō ama k ā'ot (see *glad*)
Harelda glacialis an'anē'eq
hat k ā'lt.
to hate lᴇlā'leqs
hawk qlsō woluk.
haws ralā'ms.
he, present, nē'ᴇdᴇt.
— *absent*, nē'ᴇdga.

head t'ɛmk'ā'us.
headdress ambalā'it = used in dance.
to hear nɛqɛnō'
hearsay amak ad.
—— *in compounds*, — k a.
heart k ā'ot
heavy p'a'lɛk a.
heel tō'upqa.
Heiltsuk Wutsda'
heraldic column pisān.
here ya'gua
hermaphrodite k anā'ts
herring akɛ
—— *rake* ky'ɛdɛ'
high gyeps
hip t'ɛmba'
to hit, arrow, bātak (see *arrive*)
homesick wigyatk
hoof of cow k'asɛsi'm
—— *of deer* k anā'q.
horse gyudā'n (Chinook)
house wālp, *pl.* howā'lp
—— *place in the rear of the,* sö'op'ɛl
humming-bird ts'ɛ'pts'ɛp.
hungry k'tē, *pl.* lɛk'tē.
to hurt ag ā'yiga.
husband naka.

I.

I nɛ'rıō
ice t'ā'ō
in ts'ɛm
—— ts'ɛlɛ'm
inside ts'ɛlɛ'm
instep lɛqɛnō'eqa.
instrument ha —
—— k'an —
to intend r'ap — must, anything serious, habitual.
interior, inside of, ts'ār, *pl.* ts'ɛts'ā'r
intestines hat (see *womb*)
into lō.
—— *to carry,* ts'ɛlɛ'm ga.
iron t'o'otak (see *black*).
island lɛks d'a', *pl.* lɛksbōwa'n = alone sitting
island, large stand, lɛqlɛkad'a'.
it nè'edɛt.

J.

jackknife haqpa'qt
jay, blue, kuskus'a.
just da.

K

kelp cake tlā'ask.
kidney lɛpɛ ts'a't (see *stomach*)
to kill ts'ak, yets (see *dead*)
killer (Delphinus Orca) nō'iqtl (see *fin*).
kingfisher tslā'ik.
knife hatlein'esk = instrument smoothing
—— *butcher,* ha k 'olsa'mē (ha = instrument, k 'ōts = to cut, a'me = meat)
knothole in board anō'ts (see *branch*)
to know wulā't.
Kwakiutl Gagō'otl, t'ad'a' = those far away.

L

labret k'ā'uts.
—— *perforation for,* nak 'ag a a'q (see *mouth*).
ladder k anā'qa.
Landslide tlā
large wi le'ks (wi = great).
to laugh sis'a'qa, *pl.* lasas'qs
law wulsā'
leaf la'nɛa.
to leave dā'wult, *pl.* k'adā'wult.
—— gulaqa.
—— wātk (see *from*)
—— *the house* kaɛr, *pl.* kaāq (see *out*)
left hand (ɛn)me'teklawan (ɛm an'o'n)
leg (a)si'

leg above knee k ɛlg ā'tɛl
—— *below knee* tɛmtlā'm.
to lie down nāk, *pl.* lātlk.
lightning ts'ā'mtē.
to like ɛn'ra.
lip, upper, kwaq
little tlgua
liver pē
long wī nak' (wī = great)
—— *time* ɛk ana'q, n'aga'
to look nō'etɛk, *pl.* neknē'etɛk.
—— *after somebody moving away* knō'tlstakɛlā'atl
to look up man nē'etɛk
to love hasā'oknɛnan.
lungs dep.

M

to make ts'ap, *pl.* ts'apts'a'p.
—— *the same* wilawa'ldet.
—— ɛɛ —, *pl.* g aɛɛ'—.
—— (*to catch and dry*) *salmon* ɛɛhā'n, *pl.* g aɛɛhā'n
—— *a fist to somebody* t'a'gyil an'o'n-(2)ts'al(3) arm(2) face(3)
man lo'ot, *pl.* lō'ots.
many hālda, wihālda (wī = great)
marmot kuī'yuk
to marry naksk (see *husband*).
martin lō'nō
mask amē'lɛk = used at night.
mast k an ɛm atlo'm = tree of sail.
master miā'n
mat of cedar bark ɛk an.
meat sa'mō
midnight ɛarig aā'tk.
milk ksɛm a'ks = woman water
miserable, good for nothing, k'a'mste.
—— *in compounds,* k'am —
misfortune happening q—ks.
to miss guā'ades, *pl.* gutguā'ades.
to mistake for gun
a monster of the sea ts'ɛm a'ks = in water.
month gy'a'muk (see *moon, sun*).
moon gy'a'muk ɛm hō'opɛn = sun of night.
morning k'antlā'k
mortar ɛɛbɛts'ē'
mosquito gyī'ek = piercer
mother nā'e.
mother-in-law tlāɛn.
mountain sqanō'ls.
mountain goat mɛ'ts (see *sheep*).
—— —— *young,* wākɛ
mountain lion nā'oɛō
mouse wuts'ē'ɛn
mouth kutl'ā'q (see *lip*)
mud lōa'ky

N

nail (*of finger*) tlɛqs.
—— *of toe* tlɛqs ɛm sī
name wā
narrow, long and, mɛ'qtls.
a narrow opening lōtlkō'ol
neck t'ɛmlā'nē
neckring of cedar bark lō'ō (borrowed from Kwakiutl)
nephew (sister calls sister's son) = son
—— (brother calls brother's son) = son
—— (sister calls brother's son) tlgualē's.
—— (brother calls sister's son) tlgualo's.
Neqno'q, Nɛqno'q *supernatural beings*
nest nlō'otlk
net, large, tk ātl.
—— *small,* pɛ'ns.
night hō'opɛn
night atk
nimbus mē'ɛk
no ā'yen
no (*adj.*), atlgɛ.
noise bō = any noise.
—— qaiā'meq (of falling objects).
noon lɛbarō'lt sqet'ā' gya'muk.

north ga'raiks.
north-northwest wind gyitarané'etak (see *Tongas*).
nose ts'aq
—— *ridge of*, ktō'usk am ts'aq.
nose ornament k·aik tsitlō'oak.
nostril tsam ts'aq = in nose.
not atiga.
notch of arrow hanemā'ul.
now gyā'wun
Nusqe'mta (of the Bilqula legends) ma.

O

œsophagus nā'ata.
olachen ra.
—— ha lamātk = saviour
old (*man*) wud'a'gyat (am lō'ot) = great people.
on top of laq (also beginning all names of islands).
on (*against*) tqal.
the one who tsi'n.
only g·am.
to order gun
otter wa'tsa (see *foolish*).
out of kak.
outside gye'laq
over, across, lō'r'an.
overcast ts'ē'ebe sa = close eye heaven.
owl qpālramtik.

P.

to paddle wā'l.
paddle wā'l.
paint, red, for face, maa'ā'wun.
palate atlēnā'.
palm of hand ts'am an'o'n = in hand.
pants p'aqs.
parents nagnā'at (see *father*)
to be particular whom one's child is to marry nālagyidahā'n.
to pay qtkā.
paying for burial to gens of father dō'wul (see *to burn*)
people gyat.
—— *who lived long ago* tsalgyat.
—— ts'apt.
—— *common*, waā'lan.
pestilence halatlilā'qs (*borrowed from* Kwakiutl)
pestle ai'lat.
to pierce gyetlk, *pl.* gyetlgyetlk.
pipe (a)qpēlā'n = eat smoke.
to pity ramrā'd.
place of kana — (kun —, Gyitkshan dialect)
—— —k — (only in geographical names)
—— (where something is frequently done) kspa —
—— (where something is kept) — nda.
plant of foot ts'am tsā'oqs = in foot.
to play k·amō'elak = to speak good for nothing.
to play with somebody sila k·amō'elak
poor guò'a.
porcupine ā'wat.
porpoise dall'r
potlatch yā'uk.
powder ō'malak (see *fire*)
prairie laq akp'a' (laq = on)
to prepare guldam k·a'wun- = beforehand ready
to pretend ais.
pretty amapa's (see *good*)
principal man
to pull aā'lk
—— *up* man aā'lk
to pursue lōyā'ek, *pl.* lōlıyā'ek = into go on road
to put into ts'a'lam = into.
—— lōaga'ra (lō = into).

Q.

quick t'ēn
—— *to run*, alōbā'n t'ē'n.

R.

rabbit k s

raccoon daå'olky.

rain wås.

rainbow mä'qaé

rapids dâ'eks

rattle seso' (borrowed from Tlingit ?)

raven k'åq

—— *as deity* Tqê'msæm.

—— *gens* K anha'da

rays of sun alu' gyamuk = feet of sun

ready k a'wun

to receive, sat, q——.

receiving payment for burial qdē'-wul.

—— qlō an'o'n

to receive taa'qtl.

red mesk.

relatives wulā'lak.

remains mân

to request gunâ' (see *to order*).

to return lē'tlk

—— *into* lo lē'tlk

rib ptal

rich amawā'l well to do.

right hand næsimlā'uwan (æm an'o'n)

river g·'als a'ks ascending water, *pl* g·'als aks'ks.

—— *up* (locative), gigya'nō.

—— *on the River Ksia'n,* ts'æm sīā'n.

to roll down gyā'agæltk.

roof awā'lp = house cover (ât).

—— laqa wālp = top of house

round tkwla'tlk, *pl.* tkwlyltlye'-tlk

rowlock k anwā'l = instrument paddling

to run ba, *pl.* otl

—— *into canoe* lōk·æm ba.

—— *away* gy'ō'oqk

—— —— *with somebody* da ba.

S.

safe mâtk

sail stlo'm qaâ = sail boat

salies pôkak.

salmon hân

—— *spring,* hânhlsō'ont.

—— *berry* mæk'ā'qa.

salt mân

—— tkum lâp (lâp — stone)

the same nenē'etl.

sand ā'us.

to save lxmā'l

to say hā'n

—— la.

scalp qā'lē

scar tlē'eky, *pl.* tlētlē'eky

to scold wi æm hā'ut - great say. (cf *to cry*)

scraper of stone for dressing skins halogya'tlqan.

to scream aya'wa, ayaluwāda

sea qā'tla (obsolete)

—— laq mân = on salt.

sea egg a'sōt

seal ræ'la.

—— *big,* tō ræ'la

—— *young,* k 'oā'tk .

sea lion t'ō'epan.

sea otter ptlon

scarcely dak 'ā'mtsæn

—— *loose,* tlkyō'eqk

to see ne

seldom wag'a'rqdæt.

self gyilæ'ks = back (in reflexive verbs)

—— læp

—— *myself* læp aæ'rlō

to send hā'yets.

—— *a present* yā'wus

separate lahagya't (gyat = people)

septum ndā'o ts'aq (ts'aq = nose).

—— *perforation of,* nag 'ag' æm ts'aq

to sew tlō'opk.

shaman suwa'nak

shame! tnâq!
shavings k'am tlzbi'esk = useless shaven
sheep mz'tê
sheets tsbatlo'm (see *sail instrument*).
to shout gô (see *to guess*)
shore of lake ts'oq (qtsaqtl, Gyitksan)
short tâlpk.
shoulder t'amg â'ê
sick si'epk
sickness hasi'epk.
to sing li'êml.
Sisiutl (double headed snake) Laqaqua'm — both sides head
sister (called by sister) tlz'mktê
—— (called by brother) tlkô'uk
to sit d'a, *pl.* wan
skin anâ's.
sky ts'zm laqa' — in above.
slave qâ'a (tqalwâ'alzmqtl?)
to sleep qatoq, *pl.* laqatâ'oq
slime of snail yetl
slope, gentle, wulôtla'p.
slow lâlik.
small ts'ô'usk (also, *young of animals*)
—— tlgus.
smoke p'elâ'n
to smoke qp'elâ'n = to eat smoke.
smoke hole a'la.
to smoothen tlz'lzp.
smoothened tlzbi'esk
snail hatsaa'rzlt.
snake matqalâ'liq
snow mâ'dzm
something gâ (see *what*)
—— ky'an.
sometimes k'aqpa.
son — male child.
soot g'âm
sorrow t'âqtl
south hâ'lwas (see *rain*)
southeast gi'al hâ'lwas (gial = down river, wâs = rain).
span, thumb to second finger, sâ'ola.
sparrow-hawk qakya'maxn (borrowed from Tlingit?).
to speak a'lgiaq, *pl.* ala'lgiaq
—— hâu
—— *together* sazalt hâu.
—— *against somebody* lzbi'lt hâu.
spider akyet
spring kwana'ks (aks = water)
spoon of mountain-goat horn haa'ks = instrument drink.
spruce sz'mxn, *pl* szmsz'mxn
squid hats'a'lt.
squirrel dasq
to stand hâ'yitk, *pl.* maqsk
star piâ'la.
starfish k'amâ'ts.
to stay d'a, *pl.* wan (see *to sit*).
—— *for a while* g'ad'a' = a while stay.
—— *to camp on beach* deoq
—— *boat, staying* (not moving, on water) lâ'o
to steer hadâ'l.
sternsole dâ.
stomach ts'al
stone lâp, *pl.* lzplâ'p
to stop (v. n.), gyilâ'gô
story adâ'wuq
stranger lzkagyat = separate people; *pl* hagulzgya't.
strap for basket k'anauwa'lo
to strike t'ô'oa.
to succeed, to be able to do anything, aqtl
to suck nabamâ'
suddenly m.
summer sônt
sun gyâ'muk
—— *rises* tlaksowâ'ntk gyâ'muk.
—— *sets* tkiâ'ns.
swallow sapsqi' zm aks (aks = water)
to sweep d'ô

T.

tail ts'ôp.
to take ga, *pl.* âoqtga (see *at*).
to take away sī'tqa lâ'gok(?)
to take into ts'ɐ'lɐm ga = into at.
to take from fire ɐsil
to take off blanket saga't.
tall wīnak (wi = great)
—— ɐxptlaqtl
to taste baq
tattooing on breast gyetik â'yek (see *to pierce*)
—— —— *arm* gyetlo'n
to teach ss wulâ'l = to make know
to tear down (a house) k ·oa'lt.
—— *to pieces* pe'ɐl
tears ksil
to tell matl
temples wulksitlâ'ntk.
then kyek
—— adawu'l
they dɐp ne'ɐdɐt.
thimble k'antlō'obeq = saw instrument
thin, lean, ksa sâ'yup (sâ'yup = bone?)
thirsty lōgɐ'rɐn aks ts'ɐm aq (aks ts'ɐm aq = water in mouth)
thou nɐ'rɐn
to throw into fire tqē'el.
thumb mâs.
thunder k ·alaplē' ɐm laqa' = thunderbird in heaven
thunderbird k·alaplē'ep
the tide falls ts'â aks (aks = water)
the tide rises lōks aks (it grows the water)
to tie, fasten, ts'ē'ep
sometimes tlana'k
Tinne ts'ɐts'a'ot = those in the interior
tired sōnâ'tl, *pl.* k·asōnâ'tl
to da.
toad k ·anâ'o
tobacco, Indian, wundâ'
tobacco, European, wundâ k·'ɐmk-al'os.
to-day sē'gya'wun
together ɐarâ'lt.
to-morrow tsegyets'ē'lp (see *yesterday*)
—— *day after,* tsenatâ' tsegyets'ē'lp.
Tongas land and man gyiltsanēts.
Tongas woman suwu't (borrowed from Tlingit = woman)
tongue dū'ɐla.
tooth ua'n
lower row of teeth ua'n ɐm laki'etl.
upper row of teeth ua'n ɐm laqa'
top of anything g ·a'loa (obsolete, now only "handle of paddle")
—— man 'laqa'
town k·'alts'a'p, *pl.* k·'alts'apts'a'p.
tragus ɐak 'â'pɐn mō (mō = ear)
to go traveling hat'â'qs.
tree k ·an, *pl.* k ·ank'a'n
trousers of skin p'aqs tqa (see *pants*).
to try, to examine, ɐɐntɐsal'lak
to turn back tkwis'tl (see *round*)
to turn over g ·aphâ'yetk
twins kɐlt'ɐpqadâ'l (from *two*)
—— ɐɐwɪhâ'n = making many salmon

U

ugly sqats'ɐ'r
uncle (father's brother) nɐguâ't = father
——(mother's brother) nɐbē'lp.
under tlɐr
unmarried wōk·'â'lokyetk.
upward baq.
to use hâ.

V.

valley tikut'ē'en
vein k·ag ɐm lilē' (lilē = blood).
very ɐɐmra'l.
—— *in compounds,* ɐɐm —.

visible nêsa'p.
to visit g'a k'â'edaks = for a while come.

W.

wait! hawē'nē (see *by and by*)
to wait lîé'tl.
to walk ya (see *to follow*)
to want (ha) sâ'rau.
war uldò'yet.
warm gyâ'muk (see *sun*)
watching lîé'tlks (see *to wait*)
water aks.
wave g'â'op
we nʀ'rʀm.
wearing apparel gʀs.
weir for catching seals with falling tide dala.
west qpa'la
whale tlpōn.
what gâ.
when? nda
—— *future*, tsōdʀ'nda.
—— *past*, adʀ'ndada, adʀ'ndaâ.
where wul.
where? ndâ.
for a while g'a, lâm.
white mâks
who? which? gō, nâ.
whose natl
whole tqa (see *all*)
widow, widower tʀnʀʀ ts'ak
wife naks (see *married*)
wife, first (principal wife), sima'naks (miao = master, naks = wife)
—— *second, third wife*, k'alna'ks.
wind pask.
—— *a certain* (direction doubtful), gâgtâ'tk.
windpipe haâ'lagyaq = speaking instrument.
wing k'ak 'â'l
—— *feathers* lî ʀm k''ak 'â'l.
to wish hasâ'q.
with da
without wō ——
wolf kyebâ'ō
—— *gens* laqkyebâ'o = on the wolf
woman hanā'aq, *pl.* hanā'naq.
womb hât.
woodpecker kitlwuē'ansk, sʀmgyī'ek = spruce pecker
to wrestle baq
wrist nʀqpâ'ra an'o'n
to write d'am.

Y.

year k'âtl
yes ō
—— *said from a distance* haâ' = in a high key
yesterday gyets'ē'lp (see *to-morrow*)
—— *day before*, natâ'da gyets'ē'lp.
you nʀ'rʀmʀm
young man sō'pas (ʀm lō'ot)
—— *bear* sōntîk (ʀm ol)
—— *animal* tlgʀm.

TSIMSHIAN TEXTS.

Wulaqtlâ'tʀ (where a misfortune happened by a landslide), Inverness

Tla lâ'yîkaga Ts'ʀmsia'nga amla't gaaga Kalâ'nga nʀ wul
Having left the Tsimshian come from they from the Kitnar (past) where

gʀaʀhâ'ntga. Adawul g'a lât gaaga gyâ'atsga; ada
they make salmon. And then for a while they camp at there, and

tlgō'otlg ʀm hanâ'aqaga g'âlîga sʀm'â'gyilga, gō'ga sʀm-
the child woman of a certain chief, which very

lʀgyidahâ'wulga. Tla hō'opʀlga dak 'a'mdsʀn
he was particular whom she should marry. (Perfect) night secretly

k ā'sdzkgа g'ā'ltga ā'm a sōpā's ɛm lō'otga. Adat k'ā'ga wul
comes a certain nice young man And he goes where

nā'gasga tlguā'lkaga. Ada hā'ut gasga dɛmt de batga. Adat
lies the chief's daughter And he says (?) with run him. And
(elope with him).

enā'oqtga. Adawul k·adā'wultga. Tla t wɛsga nawālptga,
she consents. And then they left. (Perfect) they having reached his house,

adawult tqal ha'ylɛt gasga gyɛ'lnqga, adɛɛl ts'ē'entga, ada
and then he against makes her stand at outside, but he enters, and

hā'us dɛp nā'otga dis nɛguā't· "Ayentl nak·anuwā'nē,
my (plural) his mother and his father "Did not you (past) make work you
(go for her sake),

nat?" "Hā'yetga da gya'laral," dā'yaga. Adawul kaā otlga
my dear?" "She stands at outside here," he replies. Then out run

tlemkti'yetkgatga. Adewult ts'ɛ'lɛm ctō'oltga Adawul
his sisters. And then into she accompanies them. And then

tqā'oqgatga aaga lōmā'maga k·agā'otga. K antlā'kga. Adawul
they eat being in good hearts. It is morning. Then

k ā'sdɛkaga tlgua wud'agya'lga, Kɛɛmwuts'ē'enga wā'atga. Ada
comes a little old person, Female Mouse her name And

hā'utgat "Tqē'el g·ɛntsemō'ɛt!" ada wa'laga tlguā'lkaga;
she says "Burn your earring here!" and she does so the chief's daughter,

adaɛlwu'lt asil daqtga tlgua wud'ā'gyatga. Adawul hā'utga
but then she from fire she takes it the little old person. Then she says:

"Dātl! Wulā'yene, gō tɛl'ngā'dɛnt?" "Avent," dū'yaga.
"My dear! do you know, who the taker of you here?" "No," she replies.

"Hatsɛɛ'rɛldɛt," dā'yaga Ada ɛɛm ba'aga tlguā'lkaga Ada
"The snail," she answered And very afraid the chief's daughter. And

hā'uaga Kɛɛmwuts'ē'enga "Ndā'e! gy'ē'eqkɛn! atlga waraldā otl,
it said the female mouse "Go! run away! not far run,

wul daoqe dɛp nɛguā'dɛn. Da yā'kɛn stō'op'ɛl atlge
where stay (plural) your parents Just walk on road back of house not

nēɛa'ba na llyā'gɛsɛmt yag a. Yo'tlɛt Nenē'etl lō
visible (past) you went (plural) downward There is slime. The same in

yā'kɛn baq k ā ɛqanē'ɛdt ada ma le'r'an yā'get! Nēnē' wul
go on road up go mountain that and you over go! It is where

da'oqs dɛp nɛguā'dan gyē'egɛt." Adawul wā'leaga
stay on beach (plural) parents below" And then she does

tlgua'lkaga Sla lām kaɛrgaga' Adaɛlwu'l bātga.
the chief's daughter. She pretends after a while to go out. But she runs.

Sem- lō yā'tgatga na matldaaga tlgua wud'ā'gyatga. Tlana'kaga
Exactly in she goes (past) she told the little old person. Having some time

wāldga, adawu'l guā'deaga na'katga. Adat wul wulā'laga
done so, then he misses her her husband. And he then knows

gy'ō'eqgatga. Adawult ɛag ā'lt hukbō'okgaaga tqanō'eaga na wi
she had escaped. And then together he called them all his great

ts'a'ptga Adawul lōllā'gɛtga. Tla ɛɛmt wātga
tribe. Then they pursue her (Perfect) exactly she reaches

tlgua'lkaga aɛm laq'o'aga aqanē'laga, da naqnā'atga wi
the chief's daughter the very top of the mountain, just she hears great

qatā'mɛqga. Adawult gō'uaga ts'ɛt lōyā'yet. Adawu'la tgye
noise. And then she guesses that they pursue her. And then down

bāt gaaga aqanē'lsga. Adaxl tlā'wula hā'naga wī qwā'mxqga;
she runs from the mountain. But always sounds great noise;

ada gyilīsks nē'ctsgatga rakstanā'ga! tla yīk·ayā'sga wī tlā'oga,
and back she looks: behold! (perfect) down comes great landslide,

k·ank a'nga lō'natga ada wu'd'a lxplā'opga gyikgyā'galtgatga. Adawu'l
trees fall and great rocks roll down. Then

ayawa'nga hanā'aqga, tlat nē'etaga wul daoqs dxp nxguā'dga,
screamed the woman, (perfect) she sees where stay (plural) her parents,

asgxt gun lōk xm; gxg ā'ōdltgaaga ts'xm g·aqsā'oga. Adawul
she ordering to go into canoe, they finish (have gone) into the canoes. And then

dī gun a'qtlgatga. Adawul lō'k·sin g·'aphā'yetget gaaga
also towards (into) she succeeds. Then go into turns round at

qsā'os nxgua'tga. Mātgaga, adaxl wul wī tlā'oaga nx wul
the canoe of her father. She is safe, but where great landslide (past) where

dxo'qtga. Ada gyilīgs naknē'etsgatga, rakstanā'ga! wī hā'ld xm
they had been And back they look, behold! great many

hats·ax'raltga k·anuwā'ltga. Adawu'lt matltga tlgua'lksga wula
snails make happen it. And then she tells the chief's daughter why

wā'ltga Ada nē'nētga da Wulaqtlā'otga wulawā'ldet.
it happened And it is at Inverness where it happened

K·anuwā'de da wul-q-tlā'ot k·at.
It makes name at where landslide-misfortune happening.

PRAYER 1

Neqno'q, Neqno'q, sxm'ā'yits, sxm'ā'yits! ramrā'dxn! tgyō nē'e
Neqnoq, Neqnoq, chief, chief! have mercy! downward look

wal tlarx'nt n ts'ā'pxnt.* Man sā'lkya sī'xnt, ada ma d'ō ts'ānt!
doing under you thy people Up pull thy foot, and off sweep thy face!

PRAYER 2

Neqno'q, Neqno'q, sxm'ā'yits, sxm'ā'yits! ramrā'dxn! ā'yen
Neqnoq, Neqnoq, chief, chief! have mercy! else nobody

txx'n qampslā'nakxnn tlx'rxnt! Neqno'q! ramrā'dxn!
the one to make you receive smoke under you! Neqnoq! have mercy!

PRAYER 3

Lō sā'lkya na kxxnā'tlgxnt, sxm'ā'yit! dxm wul gya'ksat!
Into draw thy breath, chief! (future) that it be calm!

Before dinner the Tsimshian burn some food as an offering for Neqnoq After having done so they pray.

Wa, sxm'ā'yits! dxm gā'bxn guas qplyē gx'bxnmēn. Tawā'l
There, chief! (future) you eat this part of our food. That is all

mān da gua'a; tawā'l mān da gua'a tlguanēe Gyī'axxm!
left at here; that is all left at here to your child. Give us food!

* Instead of n ts'ā'pxnt, I heard also nxagyx'txnt = *your people made by you.*

SATIRICAL SONG, MOCKING THE INHABITANTS OF MEQTLAKQATLA EMIGRATING WITH MR. DUNCAN TO ALASKA.

1. Ōyeya, ōyeya, ā.
Ōyeya, ōyeya, ā.
Gyilā'dsn wigya'tgan
Do not (future) be you homesick.
Atsnda lā'yegun, tsnda suwā'dsn.
When you will leave, when will be you a Tongas woman.

2. Ōyeya, ōyeya, ā.
Ōyeya, oyeya, ā.
Ma tsn gam yā'wus dī
You will only send a present also
Atl gsnē'gusil nds sinekā'k.
Of preserved berries kept in grease bag (*seal-lion guts*)

3. Ōyeya, oyeya, ā
Ōyeya, ōyeya, ā.
Gyilā na wi hā'utgsn!
Do not (past) you cry!
Wul gylnad'ā's Caledonia.
Because they left behind Caledonia
Tlatsedē qga'nagan.
When you will have eaten rotten salmon heads.

4. Ōyeya, ōyeya, ā.
Ōyeya, ōyeya, ā.
Gyilā'na wa k ā'dsn dā
Do not be foolish
Gō lsbslt hā'usem d. Indian E'edsen
Who against you talk the Indian Agent.

A MYTHIC TALE OF THE ISLETA INDIANS

BY ALBERT S GATSCHET.

(*Read before the American Philosophical Society, December 18, 1891*)

The study of the Indian languages of New Mexico has been neglected more than that of other sections of our wide territory and it is with much satisfaction that I present in print the first continuous text worded in one of them, that of Isleta Pueblo. It is a dialect of the Téwan, or, as it is called in J W. Powell's classification, the Tañoan family, with a translation and with a paraphrasis, which is more comprehensible to the general

reader. The source from which the two portions of the tale were obtained is mentioned in the "Comments," with all the particulars needed

Text I. The Boy-Antelope.

Kamántobu' yowa' natüen' we aı', hu'ba wi'si Pı'-'lı
It is said somewhere a village there (was), and two "Bighead"

u'-unin t'hü' aı Pı'-'lı upiü'"u-ıde a-u'kwımban yuwı'n'a
young people lived there. "Bighead" the girl being pregnant not any (had)

ă'napa bukwa'hi pa'nat, bepapa'-u uba' pa' aı hua'tohoban,
place to be delivered, her elder brother then prairie to took (her),

hu'ba u'kwoban Wı'waı bepapa'ba matoheba'n
and she bore a child. Hereupon her elder brother brought (her) back

tuei, u'-u mű'shuban pa' ai. Hu'ba wı'm'a
to the village, the babe he left prairie upon Then a

ta'li'ora ıde u'-u t'aba'n, hu'bak a'wa ŏ-ukĕmıba'n.
female antelope the babe found, and she brought it up.

Wiba'-a wi'm'a shü"-ı'de shütche'mik ta'li'ora t'ha'ban
Once a hunter while hunting a she antelope met

wim'a a ü'-a u fiŏ'rk. Ye'de u'wa u-ıde wı'ŭra i tamnı'n
(and) a boy along with (her). That boy was a runner antelopes

aı'tı t'hurı'm. Shü au'ti makwıbă'k nakũ'tchau wı'ban
than faster From the chase when he returned notice he gave

kıe'nda ta'-i-kabe' ıde, betu'winıban wie'n t'hü' we i' shı'mba
at once to the town-cacique, (who) proclaimed: four days after all

ta'-inın ıshü shanhı'nap. "wı'm'a u'wa u-ıde tohie'mınap
the people on a hunt should start "(that) a boy was going about

tamnı'n an, hu'ba ınabü'wa i'shıerhınap." Wie'n t'hü we' ı
antelopes with, and we want to seize him" Four days after

shi'mba tueı'-ide u' fier, 'lı'o fier, nua' fier ishu-mıba'n,
the whole pueblo, children with, women with, husbands with to hunt went,

ıbi t'a taba'n, bı'tchu i u'beban i'pie t'a
they the antelopes found, but were told, that not the antelopes

χuĕranıbı'nab, weı'ba-ı i u'wa u shıe'rhınap tın. Ta'lıora'-ıde
they should hurt, merely the boy to get hold of try The female antelope

ana' katchaba'n, hu'ba ü'wa-u u'miban, be e' 'lipwĕrbı'nnap.
was informed, and the boy she told not to leave (her).

Ta tamni'n inakwi'er p'ı-amba'n, hitue'rwemik buortı'm
Then the antelopes began to run, and while they ran in a ring

ta'lıora' ıde ü'wa-u u'miwe. "Na'yan kin wu'bı tun-u'χ-
the female antelope the boy called (to her). "Presently we will run north-

tu'"na-u; hu'bak inshu'minak, nütu"ăk kake' i kwimba'hi
ward, and while we pass (the ring) on the line your mother will stand

shie'rnaı, hu'bak a shu'miwe-ıfier, akweı'tohebı, hu'bak u'
on the left side, then as you pass (the line) you will fall down, and there

kake'ba hasbie'rehi" — Hu'bak ba hu'na pu'aban. — Ka
your mother will catch you." — And (so) it occurred. — That's

hui'kiem
your tail.

TEXT II THE RACE OF THE TWO CHAMPIONS.

Ka'pio kawe' ide na tü'wiban ɣie' shamba'k.
"Cold Hearted" the chief, the earth pierced through (and) above came out.

Shamba'g pa hwi'e muba'n, hu'ba kai'ban "Shi'ba
After emerging a lake he saw, and he named (it) "Times

fûn' a-i," hu'ba yeti' itai' we'ban nabat'hu' tü'ei
dark, than thence (his) people he took to the white pueblo.

Ye'dit'hu ta'ban wim'a-·natü'ei we ai', na'dshûr' tü'ei,
Here they found another village being there, the yellow village,

yo u-a' i uwe' mäm tai'nin pa' in it'hüpan a' i. Hu'bük
where wicked people were living Hereupon

nadshu'ri tu'ei wesio'mnin î ukwiewi' a'-uban nabat'hu'
the yellow pueblo, the wicked people, racers invited, of the white

tü'ei hi'tai we'-in an Wi'en 't'hü' ibemakümba'n,
pueblo its people (to be) with them. Four days did they make ready,

hû'bak shi'mba ibo'tüyiban, hu'bak imî'ban natchû'ri
then all assembled, then proceeded to the yellow

tu'ei Nabad'hü' , tü'ei tai'nin an natchû'ri tü'ei
pueblo. The white pueblo people (and) the yellow pueblo

tai'nin an yu'na kûmna' kiürba'n, ibenahumiba'n,
people thus their clothing laid down, they did bet,

hu'bak natchû'ri tü'ei pi'eni-ai hu'hi'mibi'nab;
and the yellow pueblo (expected ?) to be victorious;

natchû'ri tu'ei tai'nin ibe'wa humiba'n, hitu'mik
of the yellow pueblo the people their lives staked, saying

pa'y'a 'limba'-î 'ludelina'b natü'ei fi'er, en hi'na-a
that who was beaten would be burnt the village with, with property

we' in Nabat'hü' tü'ei hûra ibe'wa humiba'n, wi'en
his. The white pueblo also their lives staked, (and) four

t'hü' we-i' kwie'win inwû'rihiei. Shi'mba tai'nin
days after the racers were to start. All the people

hitü'tcheban, witchunaida'd kwî'ewnin hinmaku'ai. Hu'bak
assembled, of both sides the racers were ready Hereupon

thu' be'ku hinûri'ban, wi'm'a na'hwe'-iakin tai'nin himi'ban,
the next day (they) arrived, on one eminence the people went,

hu'bak yetu' a'wan wi'tad inmi'ban. Wi'wai wi'm'a
and from there onward (the racers only) went further. (From) Another single

na'hwe'yak i'nkimbak, natchû'ri tü'ei kwiewi'de be ta'kie
eminence when they disappeared, of the yellow pueblo the racer into a hawk

pеba'n. Pi'enabŏ tüba-u' i'nmimik, shumieifie'rk
changed himself. Some distance towards east when they had gone, when he passed by

tua'mban nabat'hü' tü'ei kwiewi'de: "Hababă', ta-u'ide!
he said of the white village to the tmoer: "Hahaha! antelope!

hakŭ' tieremi'k! me'tchu hwa' wa'nhi hue'bai"
good by! perhaps you will reach the east."

Hue'bai inwa'mban hue'bai kwie'r tü'-u hiumabo'ribak;
The east having reached from east towards north they turned;

takie'de toh'ŭm' mi'mı-e-i hue'bai kwi'er tü'-u;
the hawk flew ahead from east towards north;

pie'nnak ĭn'mımik wi'm'a 'lio'-u-ide nabat'hu' tüei'ti
halfways having gone one old woman from the white pueblo

tua'mban ta-u'ide. Ta-u'ide bewı'niban hu'bak ye'de
spoke to the antelope. The antelope stopped and that

'lio'-u-ide wi'-en'a u'wir wie'tcheban, u'bemik
old woman four reed-pipes gave him, telling (him)

ufetchibi'nab wi'ba hue'bai pıe'nnai, wi'ba hue'-ŭ-ı
to light (them) one from east (when) halfways, one from north

pie'nnaı, 'ba hue'nai pıe'nnab, 'ba hue'kwı pie'nnaı.
halfways, one from west halfways, one from south halfways.

Wı'wai ta-u'-ıde tüĕ'ıweban hue'baı kwıĕr pıe'nnai;
Again the antelope ran east towards some distance;

mı'mik wı'p'a ı'wir fe'tchıban; ıfa'rıbak be ĭi'
while running one reed-pipe he lighted; when he had done clouds

ye'nıban, hio-ati'n mi'mık benamakwĕrkie' iban,
arose, (and) a short way moving on did wrap in (both),

nŏ'ⁿamin. Yo-a'btinbak pa' 'lu'laıdewa'na, ta-u'-ide
it darkened. After a while rain fell in heavy drops, the antelope

beta'p bai'tun besu'rban; t'a' hue'-u-ı wa'nhı
shook itself and then wiped off (the moisture); almost the north point going to reach

pa'nab, takie' kü'wan, takıe' mo'bak ahi'mba pati'n
nearly, the hawk it met, the hawk it found all over wet

tu'la'ak arŭ'mig. Shumıei'fierk tŭ-a'mban: "Hababa'!
on a cottonwood tree crying. As he passed it said (to him): "Haha!

haku' tierumı'k; yu'ni nu' sĕ'rnın i-uta'manin;
good by! in this way men treat each other,

me'tchu hue'nai a wa'nhi;" hu'bak ta'-uide bepı'kŭrwan,
perhaps the west-point you will reach." then the antelope started,

hue'naı kwir bemabuo'rımik takie'-ıde bakiiweba'n.
the west towards veering about the hawk overtook (it).

Shumıei'fier ŭ'beban: "ta'-uide, ta'sim aku' tıeremi'k!
As he passed by he shouted: "antelope, now good by!

Yu'nı nu' sĕ'rnin ibe-i-utama'nın. Me'tchu hwe'kui
In this manner men act towards each other May be south

a wa'nhi!"
you will arrive!"

Takie'-ide shuba'n wi'wai, ta u'ide be-i'-eniban, hu'bak
The hawk passed by again; the antelope arose (from the ground), then

iwi'r fetchiba'n, wi'wai bena' pi' pe'ban, nü'"amim.
(another) reed-pipe he lighted, again did cloudy it become, it darkened

Hu'bak ta-u'ide bemadü"aru'itin bepi'kürwan, wi'wai
Then the antelope did roll itself on the ground did start on a run, again

hwe'kui wa'nhi pa'nai takie' kü'wan shi'mba pa'tinmük
at the south arriving nearly the hawk it met all over wet

aru'mig, beshu'rmik tu'la'-ag ik "Hako'amiam!
screaming, wiping himself on a cottonwood tree while sitting. "Try (again)!

vu'ni nü mü'rnin vut'ama'nin! t'a' ba'ku tie'römik; sim
in this manner men act towards each other! now good by, again

me'tchu hwe'kui a wa'nhi." Wi'wai ta-u'ide be madü"a-
perhaps to the south you get will." Again the antelope while rolling

rume'tin bepiku'rban, wi'wai wa'kwi wa'nhi pa'nab, takie'de
itself started to run, again at the south going to arrive almost, the hawk

hakiiweba'n Shumie'ifler t'a' ü tu'amban tu'mig: "haku'
caught up with As he passed to the antelope he spoke saying: "good

tieremi'k, hiu'ni nu' na'ishur' tü'ei su"a'nin i-utama'nin"
by, in this way of the yellow pueblo the people treat each other"

Wi'wai wa'kui kwiër pie'nnab ta'-uide mi'mik wibaki'n
Again south towards some distance the antelope while going another

iwir' futchiba'n, wi'wai banamakoarkiei'ban, nü'amim;
reed-pipe lighted, again clouds formed, (and) it darkened;

we'bai wa'nhi pa'nai takie' kü'ban. Shumiei'fier
(when) at the east it was to arrive nearly the hawk it overtook As he passed by

takie' tu'amban tumi'k: "Ta'sim haku' tieremi'k! yu'ni nu'
to the hawk it spoke saying "Again good by! in this way

nabat'hü' tu'ei tai'nin i utama'nin"
the white pueblo people treat each other"

Hu'bak shuba'n; ta'-in wa'nhi pa'nat, i-o-a' hintai'
Then it passed by (him), when on the point of arriving where they were to be

pe'hi pana't, takie' ide wamba'n tü'ai, ta' uide we'-i
changed into people, the hawk arrived behind, the antelope just

wöri'mmik. Takie' ide wa'na wi'm'a naxre'yak; ta u'ide
starting (again) The hawk arrived on one eminence; when the antelope

wöri'mmik takie'-ide bepiku'rban. Wi'wai wi'm'a naxreya'k
started the hawk began to run. Again to another eminence

nabat'hü' tü'ei ü'waide wiöri'bak, t'ai'nin bamu'tcheban;
of the white pueblo the boy (runner) arriving, the people perceived (him);

natchu'ri tü'ei tai'nin hitü"we: "Hita' nabat'hü' tü'ei
of the yellow pueblo the inhabitants said to themselves "Now the white village

kina' we i'tun na' wem" Nabat'hü' tü'ei tai'nin tu'ban:
ours now surely our own is." The white pueblo people said:

"Nabat'hü' tü'ei kwiewı'de toh'ûm' í'hi, na'dshûri tu'ei

"The white pueblo racer ahead is going, the yellow pueblo

kina' we í'tin na' wem." Wí'tohuna ıda'd taı'nın

ours now surely ours is." On both sides the people

ı-u'shu mi'ban, hu'bak i-u'shue nabat'hü' tü'eı u'waıde

to meet (the racers) went, and they met the white pueblo boy

toh'û'm í'bik ta'-ın wa'mbak. Nabat'hu' tu'eı hata'

ahead coming when arriving (at the starting place) The white pueblo then

wie'n tu' wo'-ı ahi'mba nadshu'ri tü'eı wěsi'emnin

four days after all of the yellow pueblo wicked (people)

hitu"ıbe'ıtın hı'lu'deban natu'eı fierda't. Bí'tohu wi'm'a

were gathered (and) were burnt the village with But one

wesí'emide wě t'hate'wa, hu'ba wö 'lu'deba, hu'ba ye'tı-i'kn

wicked (fellow) not was found, hence not was burnt, and from then

nya'n t'hu' kım we'sem t'hu'm

to this day we have bad (people) living

TRANSLATION OF THE MYTHIC TALE.

I

Somewhere, at one time, there was a village, they say, and two "Big Head" (Pí'-ïl) children lived there. One of them, the "Big Head" young woman, being with child, was unable to find some spot where she could be delivered, so she was taken by her brother to the prairie, where she was delivered. He left the babe upon the prairie and took his sister back to the village. A female antelope, finding the infant, brought it up

Once a passing hunter met a female antelope, the boy being with her. That boy could run faster than any antelope, and when the hunter reached home he notified a clan-chief, who ordered that four days after all the people should start out on a hunt, "for a boy has been seen strolling with antelopes and we must get hold of him" Four days after, the whole pueblo, men, women and children, went out on a hunt and found the antelopes. They were told not to wound or slay any of the antelopes, but to try to catch that boy only The female antelope having noticed this enjoined the boy not to part from her side. When the other antelopes began to run in a ring, that antelope called the boy to her, and said to him "Now we will go to the northwest, and when we pass the line of the hunters your mother will stand on the left side, and, as if passing, you will fall to the ground and your mother will catch you." And so it was done Now it is your turn!

II

The clan-chief of the "Cold hearted people" made his way through the earth's crust and came to the surface, After emerging from there he saw a lake and named it "Dark Tears," and then he took his clan to the

"White Pueblo." Near it he found another village, the "Yellow Pueblo," inhabited by people skilled in witchcraft. Then the Yellow Pueblo of wizards challenged the people of the White Pueblo to have a race with them. They prepared themselves during four days, when they gathered to proceed to the Yellow Pueblo. And the White Pueblo people and the Yellow Pueblo people deposited their garments on the ground and made bets. The Yellow Pueblo people expected victory with certainty, and put their lives at stake, proclaiming that the party conquered would be burnt, together with their village and all their property Four days after the racers were to start. The people all assembled and the racers of both parties made themselves ready. The next day the crowds of people ascended a hill, whereas the racers alone went onward from there.

When on their race they descended from another hill and were lost sight of, the racer of the Yellow Pueblo transformed himself into a hawk When they had gone quite a distance east, he overtook Antelope, the champion racer of the White Pueblo, and said to him: "Hahaha! good-by, Antelope! Perhaps you will be alive still when you reach the east point." Having attained that goal they turned from east to north; Hawk flew ahead of Antelope, and when they had gone halfway an old woman from the White Pueblo stopped Antelope and spoke to him She gave him four ceremonial reed-pipes, and told him to light one of them when halfway from east to north, another when halfway from the north, another when halfway from the west, and the last one when halfway between south and east, the starting place.

Starting again, Antelope ran towards the east for some distance and lighted one of the pipes while on the run When he had finished smoking it clouds arose which moved onward and enveloped both racers, so that it became dark. A while after rain began to fall in heavy drops. Antelope shook his body and wiped off the moisture. When on the point of reaching the goal at the north, he fell in with Hawk, who was dripping wet and sat on a cottonwood tree screaming. Passing by, Antelope said to Hawk "Halloo! good by! this is the way men treat each other, and perhaps you may reach the west point." Antelope started again, veered around towards the west and was overtaken by Hawk, who shouted to him: "Antelope, now good by! in this manner men act towards each other; may be you will arrive south sometime!" Hawk passed by and Antelope arose from the ground, lit another reed pipe, which brought on cloudiness and darkness again. Antelope, after rolling on the ground, started on his run again, and when he had arrived nearly at the south he overtook Hawk, wet all over from the torrential rain, screaming and wiping the water off while sitting on a cottonwood tree, and said to him. "Try it once more! In this manner people act towards each other, now good-by, perhaps you will get to the south point."

Again Antelope rolled on the ground and started out, and when on the point of reaching the south he was overtaken by Hawk. Hawk passed

him and said: "Good-by! this is the manner by which the people of the Yellow Pueblo treat each other"

When they had arrived at the place where human form had to be reassumed Hawk arrived second, and Antelope was on the way of setting out again. Hawk came upon a hill and when Antelope started, Hawk (who was transformed into a man) began to run The boy racer of the White Pueblo, who had been Antelope, was now sighted by the people, and the inhabitants of the Yellow Pueblo said among themselves: "Now the White Pueblo is certainly our own!" But those of the White Pueblo said: "Our racer is ahead of the other and the Yellow Pueblo is now ours to a certainty" The people of both sides who went to greet the racers, met the boy of the White Pueblo ahead of his rival when both came to the starting place.

Four days after this all residents of the Yellow Pueblo of wizards were gathered and burnt, and their village also. But one of their wicked number could not be found, and hence was not burnt; and from that time until now we therefore have some wizard people living.

Comments on the Mythic Tale.

The mythic tale embodied in the above pages is very popular among the Isleta Indians, and I obtained it from one of them, Henry Kendall, who, in 1885 and for some years previous, was a pupil of the Indian Training School at Carlisle, Pennsylvania. Considering his youthful years, he showed remarkable intelligence, and could reply to almost all the questions I propounded to him on the language and ethnology of his native tribe

The legend is divided into two parts. I have placed the description of the adventures of the boy-antelope before the main story, though I obtained it as a secondary appendix to the same, and have to state that this part is incomplete at its end, for it does not mention the capture of the boy by the Isleta hunters, which had been the cause for sending them out on a hunt. He and his mother were called "Big Head" on account of their bulky hair, flowing loosely around their heads, which made the boy's head appear to be of preternatural size when the wind was blowing into his hair during a race.

The words, "now it is your turn," have no reference to the story, but indicate that the tale is finished and that another narrator has his turn to count another story In the original these words convey the idea: "That is your tail," ka hui'klêm.

As to the legendary migration of the "Cold hearted" clan out of the bowels of the earth towards the "Lake of the Dark Tears," the Indians of Cochiti and Taos, New Mexico, are acquainted with it also, and relate that the lake was to the north, in what is now Colorado, and that they saw it themselves. That populations originated from the earth and crawled out of it through an opening, is a myth very frequently found in

both hemispheres. It is very conspicuous for instance in the mythology of the Iroquois and Maskoki tribes in the eastern portion of the United States, and among the Yokat, the Pomo and the Wintún in California.

Where the White and the Yellow Pueblo were nobody can tell, but the colors may be significative, for the Indian tribes of the West possess a peculiar color symbolism. The Indians of Isleta exhibit certain colors by means of paint on their faces and garments; so the red-eye section uses red and white; the black-eye section, black and white; the earth gens, white and yellow; the maize gens, white, yellow, red, sometimes also black.

Their symbol colors for the points of the compass are white for the east; from there they go to the north, which is black; to the west, which is blue, and to the south, which is red.

The race proposed by the yellow or witchcraft pueblo and performed by representatives of both towns is a race around the world. The story is told very graphically and the oft repeated exclamations and taunts which one runner shouts to his rival are ceremonially used up to our day, though some of the terms are remnants of an archaic dialect. The reed pipe, cigarette or calumet is a piece of reed three to four inches long, which is filled with tobacco and smoked only for ceremonial purposes. Many are now found in the sacrificial caves of the New Mexican Indians. It is thought to have the power to bring on rain-showers after a drought, but can be lit only by ministrants of sun worship. In fact all rain-clouds originate from its smoke and the carrizo-pipe plays an important rôle throughout the Pueblo legends.

In another version of the same story, which Mr Charles F Lummis has published in the September number of *St. Nicholas* (1891, pp. 828–835), the reeds were handed to the boy, not by an old witch, but by a mole, who for this purpose crept out of his burrow and accompanied his gift by well-meant advice.

The people of the Kapío gens or clan are called the strong, cold-hearted or persistent people on account of the persistence and energy which they evinced in digging their way through the crust of the earth up to its sun-lit surface, following the behests of their clan-chief. There are many of these clans in the Isleta Pueblo, and A F Bandelier has heard the names of fourteen, whereas from Kendall's indications I obtained the Indian names of eight only, the Kapío among them. All gentes seem to belong either to the red eyed or to the black-eyed section. Of the other clans we name the shi'u tai'nin or *eagle people*, the na'm tai'nin or *earth people*, the I'-o tai'nin or *maize people*, and the hu'makun or *game people*.

According to Mr Lummis' version, the white pueblo divided the spoils of the witch pueblo with the Isleta Indians, and later on removed to their village themselves. Such a removal to Isleta is also reported of some remnants of the Tigua people, though the principal pueblo of these was near Bernalillo on the bank of the Rio Grande.

The two runners represent some nature powers interfered with by the

raingods, as the winds or the storm clouds chasing each other in the skies. The direction taken by the hawk and the antelope is the same as that by which the calumet smoke is blown out by the participants in the quarterly sun-worship festival.

The wording of the two stories is incomplete in several respects. So the transmutation of the racers into animals for the purpose of outdoing each other is not expressly mentioned, although the story cannot be understood without it. The other version also states that the boy child left by his uncle and mother upon the prairie, was carried to the antelopes by a coyote, after which a mother antelope, who had lost her fawn, adopted the tiny stranger as her own.

By an ingenious act of the mother antelope the boy was surrendered again to his real human mother, for when the circle of the hunters grew smaller around the herd, the antelope took the boy to the northeast, where his mother stood in a white robe. At last these two were the only ones left within the circle, and when the antelope broke through the line on the northeast, the boy followed her and fell at the feet of his own human mother, who sprang forward and clasped him in her arms.

To acquire a correct pronunciation of this and other Tañoan (or Tehuan) dialects is not a very difficult task for Americans, after they have succeeded in articulating the ᶍ, ʒ and ɹ, as sounds pronounced with the teeth closed; the ɹ is uvular besides. ä, ö, ü are softened vowels or Umlaute; â, î, û indicate a hollow, deep sound of a, i, u, and ĕ is the e of *butler*, *sinker*; ʼl is an l pronounced by pressing the fore part of the tongue against the palate; ¯ and ˘ mark length and brevity of vowels.

To give a full glossary and grammatic explanation of the texts is not within the scope of this article. But some of the more necessary elucidations are as follows.

Substantives descriptive of persons, of animals and of inanimate objects seen to move spontaneously, are made distinct in the singular number by the suffix -ide, in the plural by -nin, "many"; while inanimates are in the plural marked by -n, and in the singular show no suffix. In verbs, the ending -ban or -wan points to past tense, -hinap, -hinab, -innap, to a subjunctive or conditional mode, and a final -k to a participle.

The Sun Worship of Isleta Pueblo.

There is so much similarity among the New Mexico Indians in appearance, customs, manners and ceremonial, that we need not be surprised at the equality of sun worship among all their pueblos, which is shared even by the Quéres Indians, who speak languages differing entirely from those of the Tañoan family. So a sketch of the Isleta sun worship will do for all of them.

The town of Isleta now holds about 1040 inhabitants and is divided in two parts by a wide street, called the plaça. The northern portion is inhabited by the Isleta medicine men or "fathers" (ka-a'ide, plural

kai'uin), the southern by the Laguna medicine men, who are called so for having acquired their art in Laguna, a Quéra pueblo. The differences in the ceremonial of both sections, each of which has a separate medicine house, are slight, and during the ceremonies the two "schools" of medicine-men supplement each other. They are subject to the watchful care of the captains of war, of whom there are four or five in each of the two sections

There are four annual periods of ceremonial sun worship in their pueblos, and every one of them is followed by a dance. The first of these festival periods occurs in September, the second in December, the third in February, because wheat is planted in the month after; the fourth, less important, a short time after the third. They last four days, not including the dance, and are evidently instituted for the purpose of influencing the sun deity in favor of granting a bountiful crop to the Indians.

Both medicine houses are long-shaped, running from west to east, where the entrance is. The fire burns not in the middle, but at the eastern end, the chimney being to the left of the entrance. In the roof a square opening is left for the sunlight to penetrate. Women are admitted to the house, but everything that is non Indian is excluded; none of the white man's dress or shoes are admitted; the participants have to enter without moccasins and to wear the hair long

The ceremony takes place at night, and begins with the following act of worship to the sun (tu'ikie); each medicine-man carries a short buck-skin bag filled with half-ground cornmeal, he is strewing the contents on the floor before the public, while an allocution is held to the sun, moon and stars. The Indians grasp the meal from the ground, and breathe upon it to blow off any disease from their bodies, for it is thought the meal will absorb or "burn" any disease invisibly present Then the medicine-men throw the rest of the cornmeal in a line or "road," while "sowing" it on the ground to the sun When all the meal is spent, they blow again upon their hands and *breathe up health* from them. This is done during four consecutive nights, during which the medicine-men abstain entirely from eating, drinking and sleeping, but are allowed to smoke. The calumet or reed-pipe, which is presented during the above act, is lighted and the smoke puffed first to the east, then to the north, west, south, then to the sky and to the centre of the earth No moon worship exists among these Indians.

On the fifth day commence the dances, which are held under a large concourse of people and last from eight P M to four o'clock in the morning The medicine-house holds about three hundred people, and nobody is allowed to leave before the above-mentioned hour, when the conjurers allow the people to breathe fresh air.

[In each word of the Isleta text, the emphasized syllable is marked by an *acute* accent standing after the vowel.]

Stated Meeting, December 18, 1891.

Present, 15 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the Académie des Sciences, Cracow; K. Akademie der Wissenschaften, Wien, Schlesische Gesellschaft für Vaterländische Cultur, Breslau, K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Geological and Natural History Survey of Canada, Ottawa.

Letters of acknowledgment were received from the Tashkent Observatory (135); Societas pro Fauna et Flora Fennica, Helsingfors, Finland (135); K. Zoologisch-Botanisch Genootschap, The Hague (135); R. Netherland Museum of Antiquities, Leiden (135); K. P. Meteorologische Institut, Berlin (135); Naturhistorische Verein, Bonn (134); Turin Observatory, Académie Royale des Sciences, Turin (135), Prof William Boyd Dawkins, Manchester, Eng.

Accessions to the Library were reported from the Mining Department, Melbourne, N. Z.; Geological Survey of India, K. Akademie der Wissenschaften, Wien; Académie des Sciences, Cracow; Botanische Verein der Provinz Brandenburg, Berlin; Naturforschende Gesellschaft, Freiburg, i.B., Verein für Kunst und Alterthum, Ulm; Accademia R. delle Scienze, Turin; Bowdoin College, Brunswick, Me.; Agricultural Experiment Stations at Amherst, Mass., Providence, R. I., New Haven, Conn., State College, Pa., College Park, Md, Fayetteville, Ark., Lafayette, Ind., Starkville, Miss, Topeka, Kas., Lincoln, Neb, Laramie, Wyo., Tucson, Ariz., Free Public Library, Jersey City; New Jersey Natural History Society, Trenton; Mr. Henry Phillips, Philadelphia, Director of the Mint, Commissioner of Labor, Washington, D. C.

The death of Dom Pedro d'Alcantara, December 4, 1891 (born December 2, 1825), was announced.

The Secretaries presented for the Proceedings a paper by Dr A. S. Gatschet, entitled, "A Mythic Tale of Isleta," New Mexico.

New nomination, No. 1232, was read for the first time.

The Library Committee presented the following minute:

STATED MEETING, DECEMBER 18, 1891.

On motion of Dr Greene, the Committee was authorized to report to the Society that in its opinion it was desirable that an appropriation of five hundred dollars should now be made for the purchase of books of reference

After examining into the condition of the Library, the Committee was of the opinion that the work necessary to place the Library again in order, after its removal and storage, had been satisfactorily performed and was progressing properly That the work necessary in that connection to be properly performed requires both time and care. That some delay had been occasioned by the necessity of giving greater accommodation for certain classes of the books than had been originally assigned to them

So much of the communication as related to an appropriation of money was referred to the Committee on Finance.

Curator Morris made a statement referring to the condition of the cabinets of the Society and exhibited a number of objects, including a pantograph belonging to Thomas Jefferson In conclusion he requested an appropriation of $800 for the ensuing year to enable the Curators to rehabilitate the collection.

On motion, the request was referred to the Committee on Finance.

The President reported that owing to the indisposition of the Treasurer, the Finance Committee had not been able to audit the accounts and to report appropriations for the coming year, but that they would be presented at the ensuing meeting.

Curator Morris moved that the Society request the return of the Poinsett collection from the Academy of Natural Sciences, where it is now on deposit, subject to call, and of the numismatic collection from the Numismatic and Antiquarian Society of Philadelphia.

The matter was discussed, and Dr. Cope raised the point of

order that the Society had fixed 8.30 this evening for the consideration of the Report of the Committee on the Publications of the Society and that the time had passed.

He therefore requested the report should be taken up and considered.

Curator Morris then withdrew his motion.

The report referred to was then presented by Dr Cope.

The President stated that he had received a letter from the Treasurer on the subject of the finances of the Society, and asked the pleasure of the Society if it should be read.

Dr. Frazer moved that the letter of the Treasurer be read after the debate had taken place.

Dr. Morris rose to a point of order that no report had been presented to the Society or received by it, that before resolutions be considered there should be a report before the Society

The President stated his impression as to how the matter stood.

Dr. Morris calls for the reading of the report and asks for the information the Committee was instructed to report.

Dr. Cope states that he read to the Society the original report some months ago, since which time amendments have been made to it.

Mr. Dudley stated that in the absence of the Treasurer matters relating to the finances of the Society should not be pressed to a conclusion, and moved that the whole matter be laid over until the next meeting and be made a special order.

Dr. Frazer objects that the motion is not in order.

The President decided, no point of order could be taken pending the motion to postpone

The vote being taken was decided in the negative, and the yeas and nays being called for, the vote stood for the motion, 4; against, 8. So the motion was lost.

Dr. Morris then called for the reading of the report of the Committee.

Dr. Cope states that the report he makes is the report of the Committee.

Dr. Morris asks if the report is in writing.

The President states all reports must be in writing.

Dr. Morris moves that the report be referred back to the Committee to report to the Society at the second meeting in January, 1892.

The President states that there is no continuous report, no full text, and that the matter as presented by the Chairman was disjointed and likely to lead to misapprehension. That a portion of the resolutions was out of order as affecting the laws of the Society.

Dr. Barker made some remarks.

The question being put on Dr. Morris' motion, the resolution was adopted.

And the Society was adjourned by the President.

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PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY

HELD AT PHILADELPHIA

FOR

PROMOTING USEFUL KNOWLEDGE.

Vol. XXX.

JANUARY TO DECEMBER, 1892

PHILADELPHIA:
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1892.

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXX. JANUARY, 1892. No 137

Stated Meeting, January 1, 1892.

Present, 9 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters of acknowledgment from the Institut Egyptien, Cairo (134); Museum Teyler, Harlem, Holland (135).

A photograph for the Society's Album was received from Prof. Albert H. Smyth, Philadelphia.

Accessions to the Library were reported from the Académie des Sciences, Cracow, Austria, Naturwissenschaftliche Verein des Reg.-Bez Frankfurt, Germany; Hydrographische Amt des Reichs-Marine-Amts, Messrs. Friedländer und Sohn, Berlin; Gartenbauverein, Darmstadt; Deutsche Gesellschaft für Anthropologie, Ethnologie, etc., Munich, Société Hollandaise des Sciences, Harlem, Holland; Biblioteca N. C, Florence, Italy; R. Accademia dei Lincei, Biblioteca N C. V. E., Rome; Société Americaine de France, Société de Geographié, Rédaction "Cosmos," Paris, France; Philological Society, Cambridge, England; Royal Astronomical, Meteorological, Geographical Societies, Lords Commissioners of the Admiralty, "Nature," London; Manchester Geographical Society; Theological Seminary, Andover, Mass., American Statistical Association, Dr. William Elliot Griffis, Boston, Mass.; Museum of Comparative Zoölogy, Cambridge, Mass.;

Newport Sanitary Protection Association; Hartford Theological Seminary, Travellers Insurance Co., Hartford, Conn.; Yale University, Prof. H. A. Newton, New Haven, Conn.; University of the State of New York, Albany; Cornell University, Ithaca, N Y.; American Chemical Society, Historical Society, Meteorological Observatory, New York; College of Pharmacy, Messrs. Lea Brothers & Co., Editor of the "Medical and Surgical Reporter," Editor of "Pennsylvania County Court Reports," Prof E. D. Cope, Philadelphia, Johns Hopkins University, Editor of the "American Journal of Philology," Baltimore, Md.; Department of State, Washington, D C.; Agricultural Experiment Stations, Morgantown, W. Va., Experiment, Ga, Auburn, Ala., Raleigh, N C., Lafayette, Ind., Corvallis, Oreg., Ames, Ia., Fort Collins, Colo., Berkeley, Cal.; Observatorio, Rio de Janeiro.

The following were reported as duly elected Officers and Councilors of the Society:

President

Frederick Fraley

Vice-Presidents.

E. Otis Kendall, W. S. W Ruschenberger, J. P. Lesley.

Secretaries.

George F. Barker, Daniel G. Brinton, Henry Phillips, Jr., George H. Horn.

Curators.

Patterson Du Bois, J. Cheston Morris, R. Meade Bache.

Treasurer.

J. Sergeant Price.

Councilors.

Richard Wood, William V. McKean, Richard Vaux,
Isaac C. Martindale.

Councilor for two years, vice Aubrey H. Smith, deceased

William P. Tatham.

The report of the Finance Committee was presented, and the appropriations for the year ending November 30, 1892, passed

Nominations for Librarian being in order, Dr. Morris renominated Mr. Henry Phillips, Jr., and Prof. Cope nominated Mr. B. S. Lyman, and the nominations were closed

Pending nomination for membership 1232 and new nomination 1288 were read

Prof. Cope offered for the Transactions a paper entitled "A Synopsis of the species Tied, genus Cnemidophorus."

On motion, the paper was referred to a Committee, to be appointed by the President at his leisure.*

Prof. Cope presented for the Proceedings a paper by Prof. George Baur (of Worcester, Mass.), on the "Taxonomy of the genus Emys, C Dumeril."

Curator Morris exhibited a variety of objects from the cabinets of the Society.

Dr. Cope suggested that when a paper is presented through a member of the Society for publication, in case of its non-acceptance, it should be returned to the member offering the same, and not sent to its author.

And the Society was adjourned by the President.

* The President subsequently appointed as such Committee, Drs Ryder, Jayne and Sharp.

The Temperate and Alpine Floras of the Giant Volcanoes of Mexico. *(Being a Report from the Committee on the Michaux Legacy.)*

By Prof. Angelo Heilprin.

(Read before the American Philosophical Society, January 15, 1892.)

Hemsley, in the fourth volume of his report on the botany of Mexico and Central America, enumerates 180 species of flowering plants, exclusive of sedges and grasses, which reach or pass beyond the 10,000-foot line on the slopes of the four principal volcanoes of the Mexican Republic—Orizaba, Popocatepetl, Ixtaccihuatl and the Nevado de Toluca.* This enumeration is based mainly upon the data found on the labels of the various collections illustrating the region, and omits passing citations. It is thus, necessarily, to an extent incomplete, but yet it is an admirable survey of the general features of this upper flora. To Hemsley's list the following species enumerated by Liebmann as occurring on Orizaba can, I think, be safely added,† although possibly a few of the species require redetermination before their position or synonymy can be satisfactorily established.

	FEET
Ranunculus Hookeri	10,000
Ranunculus illaveanus	10,000
Cerastium sp.?	14,000
Arenaria decussata	10,000
Arenaria leptophylla?	12,000
Oxalis latifolia	10,000
Trifolium amabile	10,000
Lupinus leptophyllus	10,000
Fragaria Mexicana	10,000
Potentilla sp.?	14,000
Alchemilla venusta	10,000
Alchemilla vulcanica	10,000
Alchemilla hirsuta	10,000
Echeveria mucronata	10,000
Sedum sp.?	10,000
Epilobium repens	10,000
Mentha sp ?	10,000
Gaura sp ?	10,000
Pimpinella sp ?	10,000
Daucus montana	10,000
Hydrocotyle Mexicana	10,000
Eryngium sp.?	14,000

* "A Specimen of the Mountain Flora of South Mexico and Central America—Biologia Centrali Americana," "Botany," iv, pp. 279–288, 1887.

† "Vegetation des Piks von Orizaba," Botanische Zeitung, 1844; also translated and abridged in Hemsley's Report, iv, pp. 146–150.

	FEET
Seseli sp.?	12,000
Œnanthe sp?	12,000
Viburnum sp?	10,000
Cornus sp.?	10,000
Stevia arbutifolia	12,000
Erigeron scaposus (Aster rivularis)	10,000
Bidens sp.?	10,000
Dahlia variabilis	10,000
Chrysanthemum (?) segetum	10,000
Cnicus Jorullensis	10,000
Hieracium abscissum	10,000
Tagetes clandestina	10,000
Baccharis Jalapensis	10,000
Diodia sp?	10,000
Gaultheria procumbens	10,000
Pernettya (Gaultheria) ciliata	14,000
Phacelia sp.?	14,000
Solanum stoloniferum	10,000
Lamourouxia Jalapensis	9,500
Pinguicula sp?	10,000
Castilleja integrifolia	10,000
Castilleja scorzonerifolia	10,000
Castilleja sp.?	14,000
Verbena pulchella	10,000
Prunella vulgaris	10,000
Plantago Mexicana	10,000
Juniperus Mexicana	14 000
Govenia speciosa	9,500
Spiranthes sp?	10,000
Serapias sp.?	10,000
Tigridia pavonia	10,000
Tillandsia sp.?	10,000
Bomarea hirtella	10,000
Agave sp.?	10,000

The approximate elevations as recorded by Liebmann are, with little doubt, given in French feet This placing does not materially alter the positions of the plants in question. To Liebmann's list I would add the following, obtained by myself and my associates during a recent exploration of the Mexican volcanoes (1890)

	FEET
Echeveria gibbiflora? (or E secunda?) on Ixtaccihuatl	14,200
Œnothera tetraptera on Ixtaccihuatl and Popocatepetl	11,000–11,500
Symphoricarpus microphyllus on Popocatepetl	10,500
Lonicera filosa on Popocatepetl	10,500

	FEET
Erigeron maximus on Popocatepetl	11,200
Baccharis concava on Popocatepetl	11,000
Gnaphalium oxyphyllum on Orizaba	12,500
Senecio salignus on Iztaccihuatl	12,200
Arbutus spinulosus on Popocatepetl	10,500
Alnus castanæfolia on Popocatepetl	10,500
Draba aretoides (?) on Iztaccihuatl	13,200

A number of other plants, such as Habenaria prasina, Platanthera nubigena, P. longifolia, Malaxis gracilis (among orchids), have been cited by Martens and Galeotti from the peak of Orizaba, so that the total list is brought close up to 200 species. I have in the table that follows appended the approximate elevations at which the plants occur, relying largely upon the data furnished by Hemsley. The letters that precede the names of the species have reference to the special mountain peak upon which the plants were found O, Orizaba, P., Popocatepetl, I, Iztaccihuatl, and T., Nevado de Toluca. The author wishes in this connection to express his indebtedness for various forms of assistance to Messrs. Thomas Meehan, John H. Redfield, Isaac Burk and Witmer Stone, members of the Academy of Natural Sciences.

		To 10,000 FEET	10-12,000 FEET	12-13,000 FEET	13-15,000 FEET
O	Ranunculus geoides		9-12,000		
O	R. Peruvianus			12,500	
O.	R. Hookeri	10,000			
O.	R. llavеanus	10,000			
O.	R. sp ?				14,000
O	Nasturtium impatiens		11-12,000		
O	" Orizabæ		12,000		
O	Draba myosotidioides			12-13,000	
P.	" Popocatepetlensis		12,000		
T.	" Tolucensis				8-14,000
I.	" aretoides ? (also O)				13,200
O	Sisymbrium canescens		12,000		
O.	" Galeottianum.		8-11,000		
T	Erysimum macradenium			12-13,000	
O.	Viola ciliata	10,000			
O.	" sp ?				14,000
T	Cerastium andinum			13,000	
O.	" orithales		12,000		
O	" vulcanicum.		10-12,000		
O	" sp ?				14,000
O.	Arenaria alsinoides		10-12,000		
O	" decussata	10,000			
O.	" bryoides			12,500	

	To 10,000 FEET	10-12,000 FEET	12-13,000 FEET	13-15,000 FEET
T. Arenaria bryoides				14-15,000
P. " "		11,500		
O. " leptophylla ? ..		12,000		
O. Colobanthus Quitensis ...		12,000		
O. Oxalis latifolia	10,000			
T. Geranium potentillæfolium	9-10,000			
O. Trifolium amabile	10,000			
T. Lupinus bimaculatus		12,000		
O. " elegans	9-10,000			
O. " glabellus	9-10,000			
P. " Mexicanus.		10-11,000		
T " montanus	9-10,000			
O. " vaginatus		12,000		
P " "		12,000		
T. " "		12,000		
I. " "		12,000		
O. " leptophyllus. ..	10,000			
O. Fragaria Mexicana. .. .	10,000			
O Spiræa discolor.		10-12,000		
O. Rubus trilobus..	10,000			
O Potentilla ranunculoides .		12,000		
O. " Richardii . . .			12,500	
O. " sp ?				14,000
O Alchemilla orbiculata.....		12,000		
O. " Sibbaldiæfolia		9-12,000		
O " venusta	10,000			
O " tripartita	10,000			
O " vulcanica. . .	10,000			
O " hirsuta	10,000			
O. Acæna elongata.........				14,000
O. Heuchera Orizabensis....			11-12,500	
P. Ribes Jorullensis		10-12,000		
T. " "		10-12,000		
O. " "				13,500
O. Echeveria mucronata.....	10,000			
I. " gibbiflora ? (E. secunda ?)				14,200
O Sedum sp.?..............	10,000			
P Œnothera tetraptera		11-12,000		
I. " "		11-12,000		
O. Epilobium repens.......	10,000			
O. Mentha sp.?............	10,000			
P. Fuchsia microphylla	10,000			
O. " mixta	10,000			

	To 10,000 FEET.	10-12,000 FEET.	12-13,000 FEET	13-15,000 FEET
O. Gaura sp.?	10,000			
O *Lopezia hirsuta*	10,000			
O Microsechium ruderale...	9-10,000			
O Pimpinella *sp*?	10,000			
O Daucus montana	10,000			
O. Hydrocotyle Mexicana .	10,000			
O. Eryngium cymosum ...	8-10,000			
O " proteæflorum ..		12,000		
T Tauschia Coulteri		10,500		
O Seseli sp?		12,000		
O Œnanthe sp.?		12,000		
O Ottoa œnanthoides. . ..		12,000		
O Peucedanum Tolucense ..			12,500	
O Viburnum sp?	10,000			
O Cornus sp?	10,000			
O Abelia floribunda	10,000			
P. Symphoricarpus microphyllus.		10,500		
P Lonicera filosa		10,500		
O Galium gemmiflorum .. .	10,000			
O Didymæa Mexicana......	10,000			
O. Ageratum adscendens....		10-11,500		
O " arbutifolium .				13,500
P " " ..		11,000		
I " " ..				13,200
O Stevia monardiæfolia . ..		8-12,000		
O " arbutifolia		12,000		
O Eupatorium adenochætum	8-10,000			
O. " grandidentatum . . .	10,000			
O " Orizabæ		10-11,000		
O. Haplopappus stoloniferus		8-12,000		
O. Chionolæna lavandulacea				12,500-15,000
I. " "				13,200
O. Gnaphalium oxyphyllum				14,000
O Sabazia sarmentosa		9-11,000		
O Achillea millefolium.....	10,000			
P Baccharis concava		11,000		
O. Erigeron scaposus	10,000			
P " maximus		11,200		
O. Senecio chrysactis ...			12-13,000	
I " "				13,200
O " cirsioides				14,000
P. " Galeottii..... ...		11,500		

	To 10,000 FEET.	10-12,000 FEET.	12-13,000 FEET.	13-15,000 FEET
O. Senecio Galeottii.........		12,000		
O. " gerberaefolius				10-15,000
O. " helodes		11,500		
O " multidentatus			9-12,500	
O " Orizabensis			10-12,500	
O " procumbens......				12-15,000
T " "		10-11,000		
L. " salignus				13,200
O. Bidens sp ?....	10,000			
O Dahlia variabilis		10-11,000		
O. Chrysanthemum (?) segetum	10,000			
T. Cnicus nivalis		11,400		
O " "				14,000
O. " Jorullensis .	10,000			
P Hieracium Mexicanum ..	10,000			
O " abscissum ...	10,000			
O " niveopappum			13,000	
O. " thyrsoideum ..		12,000		
O Tagetes clandestina	10,000			
O Lobelia nana			11-12,500	
O " Orizabae	9-10,000			
O Diodia sp ?		11,000		
O Gaultheria procumbens. .	10,000			
O Arctostaphylos pungens..			12-13,300	
P. Arbutus spinulosus		10,500		
O. Pernettyia pilosa		9-12,000		
O " ciliata.				14,000
O Pyrola Sartorii	9-10,000			
O " secunda	8-10,000			
O Chimaphila umbellata ...	6-10,000			
O. Buddleia lanceolata	10,000			
O Halenia alata............	9-10,000			
O. " nudicaulis		9-12,000		
O " nutans	9-10,000			
O " paucifolia		9-12,000		
O Polemonium grandiflora .		9-12,000		
O. Cobaea minor....	10,000			
P Phacelia pimpinelloides .	10,000			
O. " "			12,500	
L " " ..				13,900
O. Echinospermum Mexicanum..................	10,000			
O. Lithospermum distichum.		11-12,000		

	To 10,000 feet.	10-12,000 feet	12-13,000 feet.	13-15,000 feet
O Solanum verrucosum		10-12,000		
O " stoloniferum ? ..	10,000			
O. Saracha umbellata	10,000			
O Lamourouxia Jalapensis ..	9,500			
O Pinguicula sp ?	10,000			
O. Calceolaria Mexicana ..	10,000			
O. Pentstemon gentianoides		9-12,000		
O. Mimulus glabratus			12-13,500	
O. " Orizabæ .. .		10-12,000		
O Veronica serpyllifolia . ..				14,000
O Castilleja lithospermoides.		12,000		
O " pectinata ...		10-12,000		
O " Tolucensis......				13,900
T " "				14,200
O. " integrifolia	10,000			
O " scorzonerifolia	10,000			
O Pedicularis Orizabæ... .		12,000		
O Verbena teucrifolia		10,500		
O. " pulchella	10,000			
O Salvia biserrata		9-10,500		
O Scutellaria cœrulea	9-10,000			
O. Stachys repens		9-11,000		
O Prunella vulgaris	10,000			
O. Plantago Mexicana	10,000			
O Peperomia Lindeniana .	10,000			
O. Persea Orizabæ		7-10,500		
O Arceuthobium campylopodum		10-11,000		
O " cryptopodum .		10-11,000		
O " oxycedri		12,000		
O. Euphorbia Orizabæ	8-10,000			
O Urtica chamædryoides ..	10,000			
O " spiralis.......	10,000			
O Pilea vulcanica...... ..	10,000			
O. Parietaria Pennsylvanica	10,000			
O. Alnus acuminata	7-10,000			
O " Jorullensis		12,000		
P. " castanifolia..... ..		10,500		
O Quercus floccosa.........	8-10,000			
O. " glabrescens .	8-10,000			
O. " Orizabæ	8-10,000			
O. " reticulata	8-10,000			
O. Salix cana.		11-12,000		

	To 10,000 FEET	10-12,000 FEET	12-13,000 FEET	13-15,000 FEET
O. Salix latifolia............		12,000		
P. " paradoxa?..........		10,500		
O Juniperus tetragona . . .				12-14,000
O. " Mexicana......				14,000
P. " "		11,500		
P Pinus ayacahuite		11-12,000		
O " "				13,500
P. " Hartwegii.... .				13-14,000
O. " Montezumæ (also P. & L.).				10-14,000
O. " patula		10-12,000		
O Abies religiosa (also P & I).......		12,000		
O. Govenia speciosa.	9,500			
O Habenaria vulcanica ..		10-12,000		
O " prasina			12,800	
O. Platanthera nubigena			12,500	
O " longifolia ..			12,500	
O Malaxis gracilis			12,500	
O Spiranthes ochracea			12,500	
O. Serapias sp.?	10,000			
O. Tigridia pavonia..... ..	10,000			
O. Tillandsia sp.?	10,000			
O Sisyrinchium scabrum	10,000			
O. Bomarea acutifolia	7-10,000			
O " hirtella	10,000			
O Agave sp ?...	10,000			
O. Echeandria terniflora		11,000		
O Allium glandulosum ...		9-12,000 ,		
O Stenanthium frigidum....			9-12,600	

From the preceding it will appear that, exclusive of grasses and sedges, there are approximately

		FEET.
5	species which pass beyond	14,000
28	" " " "	13,000
48	" " " "	12,000
97	" " " "	11,000
115	" " " "	10,000
199	" " about reach or pass beyond	10,000

By far the greater number of the species enumerated in the preceding list are cited from the Citlaltepetl (the "Star Mountain"), or Peak of Orizaba, as it is commonly known, which, from the specially favorable conditions surrounding its position, has attracted the attention of botanists more than any other mountain of Mexico. With its base buried in the

luxuriant forests of the eastern *tierra caliente*, it presents an unbroken botanical front to the line of perpetual snow, 15,000 feet above the sea, and thus exhibits in beautiful sequence the different vegetal zones which climate more particularly has marked out There is probably no other mountain in the world which so thoroughly presents the essentials of a study of mountain floras as Orizaba; the luxuriance of growth at its base, the high level to which the forest zone attains, and the isolation, due to volcanic structure, of the peak itself, are the specially distinguishing features of this summit So far as the temperate and alpine floras of the other giant mountains of Mexico are concerned—Popocatepetl, Iztaccihuatl and the Nevado de Toluca—there is no question that they are very closely related to the similar floras of the Star Mountain, as indeed it would naturally be expected they would be. Of this correspondence I have satisfied myself through a personal examination of the floras *in situ*; unfortunately, the conditions attending the ascent of these mountains were such as to prevent us from making more than "sample" collections, but they illustrate in a broad way the general features of the vegetation. All four summits rise from the table land through a zone of pine forest. On the western slope of Orizaba, or towards the town of San Andres Chalchicomula, we found the pines, with *Pinus Montezumae* (var *macrophylla*—the common long-leaved species), *P Teocote* and *P. pseudostrobus*, to begin as a distinct zone, at an elevation of some 9000 feet, occupying nearly the same position on the western slopes of Popocatepetl and Toluca, on Iztaccihuatl the line descends approximately 500 feet lower There can be little question, it appears to me, that the limitation downward in these special cases is not so much dependent upon climatic conditions as it is upon certain physical peculiarities of the surroundings and the artificial means that have been resorted to for the removal of the native growth The vast accumulation of ash and dust sand which to-day envelopes the plateau base of the mountain, deposited as a disintegration downwash from above or as a wind sediment from below, lends itself at best to the development of but a scant vegetation; large areas are wholly barren, while others are redeemed only by a withered and scattered growth of grass and insignificant herbs. Over these lower areas trees are but distant ornaments That this limitation of 9000 feet is not the actual or natural boundary of the pine zone is shown by the condition of the eastern face of the mountain, which descends from the plateau, or by the face of the plateau itself Thus, on the hills about the town of Orizaba, at an elevation of some 4800 feet, we observed *Pinus pseudostrobus*—a form closely related to *P Montezumae*, and also entering into the composition of the lower pine woods of the Citlaltepetl—growing in great profusion; and on the steep southern face of the plateau descending to the volcano of Jorullo, we followed *Pinus Montezumae* or *P. occidentalis* to the level of 4000 feet, or perhaps even lower—far below the upper level which the palms attain in certain parts of Mexico.*

* We observed a palmetto-like form, probably a Brahea, growing abundantly on the

The extended vertical distribution of the pines is very remarkable, not less so than the abrupt limitation southwards of the genus If the identification of the common form of British Honduras and of Cuba (*Pinus Cubensis*) with *P Montezumæ* (*P occidentalis*) be considered correct—for which, however, there appears to be considerable doubt—and similarly, the identification of this last with the species (or one of the species) growing in the upper vegetal zone of Orizaba, etc , then the range of a single species is made coincident with that of the entire genus—indeed, so far as the western hemisphere is concerned, with that of the entire family or tribe. Nor is there, probably, another instance known of a perennial having an equivalent range of 14,000 feet, or upwards of two and a half miles * Humboldt places the lower limit of *P Montezumæ* in Mexico at 4092 feet (at very nearly the position in which I found it below Buena Vista on the road connecting Ario de Rosales with the hacienda of La Playa, base of Jorullo), and its upper limit, as determined by him on the Cofre di Perote, at 12,936 feet † Liebmann places the upper limit, on the northwestern side of the Peak of Orizaba, still higher, or at about 14,000 feet ‡ I am not certain that we observed, whether on Orizaba, Popocatepetl, or Ixtaccihuatl, the common "long leaved Mexican pine" at anything like this elevation , certain it is that while this species enters, with the *P Teocote* and *P pseudostrobus*, very largely into the formation of the *lower* pine woods of the mountains in question, at elevations of from 9000 to 11,000 feet or thereabouts, it is distinctly succeeded in the upper zone by the very common short leaved form (*Pinus Ayacahuite*) and *P. Hartwegi*. That these various forms have been repeatedly interchanged by botanists and travelers is positive ; nor, indeed, in the present uncertainty regarding the species of Mexican pines, would it be safe to assert that all these species are really distinct. We also found the upper limit of the pines on Orizaba to be close on the 14,000-foot line, but on the adjacent Sierra Negra, which faces the peak of Orizaba on the south, the tree line appears to rise fully two or three hundred feet higher As Liebmann observes, the trees become in a measure dwarfed, though never shrubby or prostrate. At an elevation of 13,200 feet, where they

limestone mountains west of Yautepec (on the ridge separating that town from Cuernavaca) at an altitude of 4500 feet , the same species appears still higher, 7000–7500 feet, on the similar calcareous soil of the region about (north of) Tehuacan At both localities the palm, together with the Viznaga (*Viznaga mammillaris*), and the organ cactus, forms the predominant feature of the vegetation , the stem rises to some 30–45 feet. Liebmann states that Corypha and Chamærops are both found on the highlands of Mexico at an elevation of 8000 feet. Hemsley is probably correct in referring one of these forms to Brahea ; the other may be a Chamædorea, but it seems to me more likely to be a true Sabal Drude has, perhaps, doubted the accuracy of Liebmann's observations, since he makes no mention of any Mexican palm rising above 5000 feet (" Die Geographische Verbreitung der Palmen," in "Petermann's Mittheilungen, ' 1878 'Handbuch der Pflanzengeographie," 1890)

* The Oregon pine or Douglas fir (*Pseudotsuga Douglasii*) extends its habitat from the sea level on the Pacific coast to an elevation of nearly 10,000 feet in Colorado

† "Views of Nature," Bohn's edition, p. 314

‡ If French feet, then more nearly 15,000 feet

still formed groves or thickets, they rose to a height of certainly not less than 30–40 feet. Roezl, as quoted by De Candolle (Parlatore, in the "Prodromus," xvi, ii, p. 400), and Hemsley give, it appears to me, too great an elevation for the pines on Popocatepetl and Ixtaccihuatl, 13–14,000 feet; the first figure more nearly represents the true limitation. Felix and Lenk * delimit the zone on Popocatepetl at about 200 feet above the ranch of Tlamacas, or, according to their statement, at almost exactly 13,000 feet, my own observations place the line somewhat higher, 13,160 feet †—or about 100 feet lower than the point where we met with the last pines on Ixtaccihuatl

At no other point on the earth's surface do the pines attain such an extreme elevation as on the Mexican volcanoes, indeed, if we except the *Juniperus fœtidissima* found by Thomson in the Spiti Valley, Himalayas, at an altitude of 15,000 feet, the entire group of the Coniferæ almost everywhere falls far below this line. Barring exceptional cases, the uppermost trees on the Himalaya, as in north temperate regions generally, are conifers, but these virtually cease at an elevation of some 12,000 feet, ‡ although flowering plants continue for still 7000 feet higher. On Mt. Ararat, according to Drude, the uppermost trees are birches, poplars and willows, and not conifers, § the tree line on the northwestern face of that mountain being situated somewhat below 8400 feet. On the extinct volcanic summit of the San Francisco mountain (Northcentral Arizona, lat. 35° 20′), with an elevation of 12,794 feet, Hart Merriam found the timber line at approximately 11,500 feet, marked by the disappearance of the fox tail pine (*Pinus aristata*) and Engelmann's spruce (*Picea Engelmanni*). A somewhat higher level is, perhaps, reached by the balsam (*Abies subalpina*) in Colorado—12,000 feet ‖

The point of most interest that suggests itself in connection with the distribution of the Mexican pines is the distinctness of the forms from those occurring in the region lying to the north. With barely an exception ¶ all the species occurring on the lofty volcanoes are endemic to the Mexican (Central American) region, and are consequently not found in the pine tracts of the Rocky Mountain system. In view of the longitudinal

* "Beiträge zur Geologie und Paläontologie der Republik Mexico" p. 28, 1890.

† It is interesting to note in this connection that Von Gerolt, who made the ascent of Popocatepetl in 1833, places the *limit of vegetation* on that mountain at 12,614 (English) feet, not including "a mossy plant, *Arenaria bryoides*, which is occasionally found some hundred feet higher." Egloffstein, "Geology and Physical Geography of Mexico," 1864, p. 25

‡ Schlagintweit observed the last groups or "woods" of these trees at an elevation of 11,800 feet, although cultivated specimens of *Populus Euphratica*, grown in the gardens of the monastery of Mángnang, were found nearly 2000 feet higher, at 13,460 feet ("Sitzungsber. Münch. Akad.," 1865, i, p. 236). This investigator places the limit of Phanerogams on the Gunshankar Peak (lat. 31° 22′, long. 80° 19′) at 19,237 feet (*op. cit.*, 1867 p. 516, also in "Results of a Scientific Mission to India and High Asia")

§ "Handbuch der Pflanzengeographie," p. 402.

‖ C. S. Sargent, "The Woods of the United States," p. 123, 1885

¶ *Pinus cembroides* ranges into the Santa Catalina mountains of Arizona (2500 feet elevation)

direction of these mountains and the fact that they are continued by a plateau system of elevations of from 6000–8000 feet into the very heart of the volcanic area, this circumstance appears a little remarkable; its explanation is possibly to be sought in the same series of conditions which have determined the endemic character of the alpine flora generally of the Mexican and South American summits. In the case of such hardy perennials as the pines, however, it is more difficult to account for the anomaly than in that of the seemingly much more pliable herbaceous plants, which are commonly assumed to lend themselves more readily to changes or modifications as the result of alterations in the physical conditions of their surroundings. The comparatively recent origin of the Mexican volcanoes proves that the floras which they carry must be of equally recent date; it follows, therefore, as a corollary that if the components of these floras are derivatives from preëxisting floras still extant, such modifications of structure as they have undergone must have been rapid in their formation—more rapid, probably, than is generally allowed for modifications of this kind. Can it, perhaps, be assumed that the special characteristics and conditions which belong to elevated volcanic cones are conducive to rapid change? It is true that not all the volcanic summits of Mexico are of equivalent age, and it can probably be assumed that some are of even considerably greater age than others (although possibly belonging to the same period of geological time), thus the worn-off and effaced summit of the Iztaccihuatl, without doubt, long antedates such perfect cones as Orizaba and Popocatepetl, and the serrated ridges of the Ajusco, or their continuations, bear a similar relation to the series of more or less perfect cones and bosses which are distributed over the plateau north of the line occupied by them. Possibly the existing flora was first developed on such ancient slopes, whence by a gradual transference it gained the position which it now holds (largely modified and altered in form).

It must be admitted, however, that our knowledge on these points is still so limited that it can scarcely originate more than speculation or surmise; it no more explains the present problem than it answers the question Why are the pines limited to the northern hemisphere—or more definitely, why the North American pines cease so abruptly in Nicaragua? What are the special conditions which prevent them from spreading further southward, and why is the upper zone of the Andes destitute of these trees? Indeed, the endemic character of the Mexican conifers and the absence of their immediate representative in South America might suggest to some an origination wholly independent of a true North American stock—an origination suggestive of a former Atlantis. The presence of pines in some of the West Indian islands—Cuba, Jamaica, Santo Domingo, and again in the Canary Islands*—might, moreover, be taken in evidence of a trans-Atlantic land connection having actually

* *Pinus Canariensis*, the last of the three-leaved pines from the western region of the Old World.

existed at a comparatively modern period. Botanists have, indeed, long since pointed out the relation existing between the modern coniferous flora of North America and the equivalent Miocene flora of Europe—a relationship which might almost be considered an equivalency—and have even hinted at the possible derivation of the one from the other.*

The singular distribution of the pines makes it certain that neither their vertical nor their horizontal (or longitudinal) range is determined by conditions of temperature alone, or, perhaps, even primarily. Humboldt has plainly stated this fact: "This absence from the southern hemisphere of the true Abietineæ, of the Juniperineæ, Cupressineæ and all the Taxodineæ, as likewise of the Torreya, of the *Salisburia adiantifolia*, and of the Cephalotaxus among the Taxineæ, vividly reminds us of the enigmatical and still obscure conditions which determined the original distribution of vegetable forms. This distribution can by no means be satisfactorily explained, either by the similarity or diversity of the soil, by thermal relations, or by meteorological conditions."† Mr Thomas Meehan has repeatedly insisted that the timber line on mountains is not essentially a fixture determined by climate, but depending more particularly upon special topographic features of the surroundings—the character of the soil, amount of downwash, exposure to storms, etc. The critical comparison of different timber lines, taken in conjunction with vertical distribution, shows that this contention is at least largely true. The abrupt termination of the forest on some of our mountain heights, whether high or low—as for example on the Rocky Mountains or on Mt. Katahdin—and the continuance of trees of still noble proportions practically to the very limits of disappearance, point very strongly to this conclusion, a conclusion which is further supported by the reappearance in many places (of the same region) of the identical forest in positions considerably more elevated (and presumably much better adapted to a special development). The irregular height to which the "Waldregion" attains on the Alps and on other mountains of Southcentral Europe is certainly attributable at least as much to topographic (physiographic) as to climatic conditions. Thus, on the main body of the Central Alps (46°–47° N lat.), the limit of trees is found at approximately 6400 feet; in the Southern Alps of Dauphiné (45° N. lat.), at 6900 feet (in places only 5550 feet), on the Illyrian Alps, of Karst, Austria (46° N lat.), at 5000 feet, and on the Dinaric Alps of Bosnia (44° N. lat.), at 5800 feet. So, again, on the Jura mountains, in lat. 47°, this limit is reached at 4900 feet, whereas on the Altai, in lat. 50°, it rises nearly 1500 feet higher, or to 6400 feet.‡

The limitation to height of herbaceous plants parallels the history presented by trees. It is generally assumed in their case that the line of

* Hildebrand, "Die Verbreitung der Coniferen," "Verhandl. d. natur. Vereines der preuss. Rheinlande und Westphalens," xviii, p. 377, 1861.

† "Physiognomy of Plants," in "Views of Nature," p. [illegible], Bohn edition, [illegible].

‡ Grisebach, "Vegetation der Erde," i, pp. [illegible] *et seq.*, [illegible].

perpetual snow is the determinant of absolute or greatest elevation, but this is not strictly the case. Thus, it is well known that in the Swiss Alps phanerogamic plants are found nearly 2700 feet above the snow line, the beautiful mountain pink (*Silene acaulis*) has been met with at an elevation of 11,283 feet,* and *Androsace glacialis*, a primulaceous plant, at 11,408 feet, on the Piz Linard (Grisons). Indeed, Heer has determined not less than a hundred species (or approximately that number) of flowering plants (representing twenty-three families) as growing on the Rhætic Alps above the snow line (9000 feet), and Martius has recorded twenty-four species from the Grands Mulets, Mont Blanc, on elevations ranging from 10,540 to 11,300 feet.†

So far as the Mexican summits are concerned, I think it may be safely asserted that the tree or timber line is not an absolute one, in other words it is not one which is determined by the natural conditions of growth of the plant itself, but rather it is dependent upon purely local causes. It is scarcely conceivable, for example, that on Orizaba, where at an elevation of upwards of 13,200 feet the trees were still 30–40 feet in height, an additional 500–600 feet should so materially alter favorable (climatic) conditions of growth into unfavorable ones as to produce extermination; indeed, we must assume that this change is even much more rapid, for at the very verge of the timber line the pines, although necessarily harboring a considerable number of small specimens, still easily measured 20–30 feet. This condition we found repeated on Popocatepetl and Ixtaccihuatl, most markedly, perhaps, on the latter mountain; I am positive that some of the uppermost pines here, very close to the disappearing line, were not less than 40–50 feet high, if not higher. Again, on Popocatepetl, as has already been remarked, the timber line ceases a little above 13,100 feet, the trees themselves being of rather inconsiderable height. On an equivalent height on a spur of the Sierra Tlamacas,‡ however, the pines are still noble foresters, and on the Sierra Tlamacas itself, off in the direction of Ixtaccihuatl, they rise to elevations several hundred feet higher. There is little doubt in my mind that the actual limitation on the summits here referred to is mainly determined by such physiographic conditions as steepness of slope, downwash of soil, exposure to the cold waters of melting snows, storms, etc. How much higher, under more favorable conditions, the tree line might have attained, I am unable to say, but it is interesting to note that such as it is, it is virtually the most elevated tree line in the world.§

* Humboldt, "Views of Nature," p. 218. I met with this plant (summer of 1891) in various parts of Greenland, between lat. 69° and 77° 40′, growing from the sea level to an elevation of 1600–2600 feet.

† Grisebach, op. cit., i, p. 167.

‡ Crossed just before reaching the ranch of Tlamacas.

§ This statement, perhaps, requires modification. Pöppig, from manuscript data submitted to him by Engineer Benjamin Scott, asserts ("Reise in Chile, Peru and auf dem Amazonenstrome," ii, p. 80) that on the Peruvian Andes, near the hamlets of Huaylillas de Patcul and Uchuutuca, treelets of (?) *Polylepis racemosa* are found at elevations of 15,000

In the north temperate regions the timber line, where marked by the disappearance of conifers at all, seems to characterize indiscriminately the zone either of pines or firs (spruces), probably in the greater number of instances the latter are the most far reaching trees. In the Harz mountains, the Riesengebirge, the Bohmerwald, the Jura mountains, and in many parts of the Alps, Carpathians and Pyrenees the firs are the delimiting zone of forest, but again, in other parts of the Alps and Pyrenees, in the Tátra (Central Carpathians), the Altai, and on many of the mountain crests of the Mediterranean region, the pines (notably *Pinus cembra*) considerably overtop the firs, even if they do not form that distinct vegetal zone which is constituted by the latter. In North America, perhaps even more than in Eurasia, do the firs constitute the uppermost coniferal zone, a zone which is so eminently defined on the higher elevations of the Appalachian system of mountains (White mountains, Black mountains of North Carolina) In the Rocky mountains the pines and firs both attain the timber line, but the latter predominate by far as a zone making element; indeed, on many of the more elevated summits the pines only sporadically mingle in with firs. It is the more interesting, therefore, to find that on the still higher summits of Mexico the reverse order obtains. The zone of firs (consisting of *Abies religiosa*), as I had occasion to observe on Orizaba, Popocatepetl, Ixtaccihuatl and the Nevado de Toluca, virtually ceases at about 11,500–12,000 feet,* or two thousand

and 15,912 feet, or nearly 150 feet higher than the *Saxifraga Boussingaultii*, from the slopes of Chimborazo, which Humboldt considered to be "the highest growing phanerogamic plant in the world" ("Views of Nature," p 234) Again, Humboldt himself observed occasional specimens of tree-like Verbesina on Pichincha at an elevation of nearly 14,400 feet ("Kleinere Schriften," p 57) It seems likely that the measurements of altitude in both of those cases are given too high a value at any rate, the more recent surveys of the Andean summits have, in nearly all cases, tended to diminish rather than to increase the formerly accepted measurements. Raimondy reports *Sambucus Peruviana* and *Polylepis racemosa* from an elevation of 14,890 feet on the Peruvian Andes; *Polylepis tomentella* was observed by Weddell at 14,710 feet, and *P lanuginosa*, by Jameson, on Chimborazo, at 12,965 feet Most of these upper trees are dwarfed, scarcely attaining more than a few feet in height, and, indeed, the actual timber line falls considerably below the elevations here given Humboldt makes the interesting observation that in the region about Quito trees 45–60 feet in height are rarely met with above some 8800 feet At Chicla, on the Peruvian Andes (12° degrees south of the Equator), at an elevation of 12,200 feet, Ball observed but a single tree, *Sambucus Peruviana*, a form closely related to the common black elder of Europe ("Notes of a Naturalist in South America," p 101, 1887) In remarkable contrast to these cases of special elevation is the condition of the forest vegetation on Kilima 'Njaro, on approximately the third degree of south latitude According to Dr Hans Meyer, the "average limit of the forest belt is about 9600, the extreme limit imposed by the climatic conditions being some six or seven hundred feet higher" ("Across East African Glaciers," p. 183, 1891). phanerogamic plants are, however, found on the same mountain up to 15,420 feet (op cit, p 187) In the Sunda Islands (Java, Sumatra, Borneo) which lie almost under the Equator, as is well known, the timber line also falls below 10,000 feet, although individual mountain summits rise 2000 and 2500 feet higher

* We met with the last spruces on Ixtaccihuatl at approximately 11,500 feet, the lowest were found at about 9280 feet, or very nearly 1000 feet lower than we observed them on the peak of Orizaba. I have no doubt that the species in question is found at

feet below the line of the pines, and yet more below that of the last junipers.*

We observed the last specimens of this genus (*Juniperus tetragona*) covering the bare rocks of Orizaba at some little distance beyond the actual tree line. It is not always easy to determine just what are the causes which operate towards establishing and regulating the succession of special vegetal zones on mountain slopes any more than it is possible, in our present knowledge, to explain the anomalies of succession on the horizontal plain stretching towards the Pole. The law of parallelism in horizontal and vertical succession, which Humboldt first formulated, and which was founded on the perception of climatic influences almost alone, while it touches the broader aspects of the problem, does not essentially explain the detail; nor can it be said that the modification of this law, defined by an excess or decrease of solar illumination, the horizontality or verticality of the solar rays, etc. (as elaborated by Wahlenberg, Grisebach and others), any more explains the special contradictory features of this distribution. Preoccupation or first possession of a region by a special group of plants has doubtless much to do with the problem, it is an important factor towards determining supremacy, and must, therefore, largely regulate the outcome from a competitive struggle for existence.

The oaks of the Mexican volcanoes occupy the lower pine belt, ranging to about 10,000 feet. We obtained three species on Orizaba—*Quercus reticulata*, *Q. Orizabæ*, and a third form which we have not yet been able to identify. Above 9000 feet they are comparatively rare and no longer form forests, such as are to be met with in the lower region of 4000–6000 feet. In the more or less open dust country below the pines—*i. e.*, below where the pines appear on the western slope of Orizaba, about 9000 feet—they are still fairly abundant, forming groves and copses, but once entering the pines they appear only as stragglers. The same condition prevails on Popocatepetl and Ixtaccihuatl. Associated with the oaks are one or more species of alder, *Alnus Jorullensis* and *A. castaneifolia*, we found the former a tree of some 15–20 feet height, extending up to 12,000 feet or more. The second form, which is now generally looked upon only as a variety of *A. Jorullensis*, and which we found on Popocatepetl at an elevation of about 11,000 feet, is a member of the flora of the Peruvian Andes—one of the very few plants which are common to the two regions.

As regards the non arboreal vegetation of the Mexican summits, the list of species given at the beginning of this paper sufficiently illustrates

a very much lower altitude than where we actually observed it, indeed, it appears that Humboldt and Bonpland met with it not far from the forest of Chilpancingo, south of the Mexican plateau, at an elevation of barely more than 4000 feet.

* It is true that Schiede mentions the tree as rising to the timber line on Orizaba (Parlatore, in De Candolle's "Prodromus"), but I believe the statement to be erroneous. Galeotti's observations, which accord almost exactly with my own, place its limit at some 12,260 feet. Hemsley, on the other hand, reduces the elevation to 10,500 feet, a figure which is 1500 feet too low.

its character. A few remarks from personal observation may not, however, be amiss. We found the most varied flora—*i. e.*, in the region above 9000 feet—on Popocatepetl, and it was here, too, that the vegetation presented itself in its most luxuriant aspect.* Taking the physiognomy of the four summits into one general consideration, it may be said that the most noticeable or distinctive plants are two or more species of Senecio and a lupine (*Lupinus vaginatus*). The yellow flowers of the former and the blue of the latter were an ornament to the vegetation almost everywhere between 10,000 and 12,000 or 13,000 feet. *Senecio chrysactis*, a graceful plant 3–4 feet in height, reaches the limit of pines on all four of the loftiest summits, rising somewhat higher, seemingly, than *S. Galeottii*.

These yellow "asters," with the tall lupine, form a compact undergrowth to the upland pines, especially where the latter have been in one way or another thinned into groves, leaving patches of open country in their midst. In such localities the vegetation is truly luxuriant, and the eye is charmed by the brilliancy of color which is everywhere manifest. The horseman traverses a flowering prairie with his animal buried to its flanks in the rank growth; on Popocatepetl, more particularly, is this the case. Above 13,000 feet we found the greatest number of species in flower on Ixtaccihuatl. Here, immediately about our night's camping ground, at an elevation of approximately 13,200 feet, we found a veritable garden. The ground was decked with a profusion of the blood-red *Castilleja Tolucensis*, the carmine *Echeverria gibbiflora* (or *E. secunda*?) and the yellow *Ageratum arbutifolium*, while from the rock-fissures protruded tufts of *Asplenium trichomanes* (var. *majus*)—the only fern we were fortunate enough to secure for our collections—and partially concealed masses of *Chionolaena lavandula*, *Phacelia pimpinelloides*, etc. The moisture which here accumulates from the melting snows combines with a favorable position and exposure to sunlight towards a specially luxuriant growth. At the base of the boulder mass which marks the last stage in the ascent of the Nevado de Toluca—consequently at an altitude of 14,200 feet—we found the ground similarly carpeted with flowers, noticeably so with clumps of *Castilleja Tolucensis*, but at this elevation the general aspect of the region was far less cheerful and inviting than on Ixtaccihuatl. There was little or no grass or moss, and the Castillejas and Echeverrias merely occupied sand spots between the lichen-covered rock débris. The last flowers to disappear on Orizaba, so far as our own observations extended, were the *Castilleja*, already mentioned, and a *Draba* (*D. aretioides* or *D. Popocatepetlensis*), both of which follow close to the snow line, or very nearly to 15,000 feet—possibly even above this point. The last-named plant was also found on Popocatepetl and Ixtaccihuatl, but at a somewhat lower level (13,000–13,200 feet).

* I have no doubt that the eastern face of Orizaba—the side from which Liebmann and Galeotti made their ascents—is much more prolific in plant life than the one turned towards the dry and dusty table-land (the side of San Andres Chalchicomula), whence our party scaled the summit.

Among the more distinctive vegetal features of the lower volcanic slopes may be cited the dense bushes or thickets of *Arbutus spinulosa* and (the rigid) *Symphoricarpus microphyllus*, which border the rough mule-ways for long distances at (approximately) the 11,000 foot level, characterizing there a partial zone of their own. We found the ericaceous plants particularly abundant on Popocatepetl. With them is associated the magnificent red-flowering honeysuckle (*Lonicera filosa*), a stately plant 4–6 feet in height, which is certainly one of the most attractive growths of the region. To this zone succeeds a belt of composites, characterized by a special development of *Baccharis conferta* and *Erigeron maximus*. It need hardly be said that the zonal lines—if, indeed, they are really worthy of such characterization—are not well differentiated, the plants of different belts mix in well with one another, so that everywhere there is considerable overlap. Nor do the same plants always occupy the same positions on the different mountains. Still, an approximation to zonal separation is to an extent manifest, especially where the maximal development of any series of plants is reached.

One of the most beautiful plants of the roadside, most abundant, perhaps, between 11,000 and 12,000 feet, is a pink evening primrose (probably *Œnothera tetraptera*) with flowers somewhat smaller than those of a rose; the plant can, indeed, be appropriately designated the "alpine rose" of the Mexican mountains, as it is not unlike in general appearance a wild rose, though provided with only four petals. Its showy blossoms constitute one of the glories of the mountain roadways, but it is not entirely absent from favored open spots of the lower regions. We met with the plant abundantly in the meadows about Patzcuaro, at an elevation barely exceeding 7000 feet. Here it was associated with *Jussiæa repens*, *Cuphea procumbens*, *Sisyrinchium micranthum* (?), *Baccharis conferta*, etc.

The preponderating element in the upper Mexican flora is made up of forms which distinctly represent the temperate and Arctic regions, and not of modifications (suited to a more rigorous climate) of the lower or basal floras of the same region. This is the condition which is found to characterize the high mountain floras of tropical regions generally, as distinguished from those of temperate climes, and for reasons which have been well pointed out by Engler in his exhaustive treatment on the development of the vegetable world.* Most of the Mexican plants occurring above 10,000 feet, while they are to a very great extent congeneric with the forms of temperate North America, are specifically almost wholly distinct. Indeed, the relationship with the plants of the much more distant Andean summits, so far as the recurrence of identical specific forms is concerned, appears to be considerably more intimate than it is with the forms belonging to the north. The reason for this is to me at the present time entirely conjectural.

* "Versuch einer Entwickelungsgeschichte der Pflanzenwelt," ii, 1882.

The following species are found on the Andean summits from New Grenada to Peru or Bolivia.

Ranunculus Peruvianus.
Sisymbrium canescens.
Cerastium Andinum.
Arenaria alsinoides.
Colobanthus Quitensis.
Trifolium amabile
Alchemilla orbiculata.
" Sibbaldiaefolia.
" tripartita.
" hirsuta.
Acaena elongata.
Ottoa oenanthoides.
Tauschia nudicaulis.
Lobelia nana
Halenia elata.
Saracha umbellata.
Mimulus glabratus.
Veronica serpyllifolia.
Alnus acuminata.
" Jorullensis.
Sisyrinchium scabrum

—about ten per cent. of the entire flora. In view of the distance which separates the two regions—some 900 to 2400 miles—this is, after all, not such a small number, indeed, the wonder is rather that so many alpine forms should have found it possible, in the region of the tropics, to cross the depression of the Isthmus of Panama.

Observations on the Chinantec Language of Mexico.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, January 15, 1892.*)

Name.—The folk-name *Chinanteca*, plural of *chinantecatl*, is a word in the Nahuatl language meaning, "inhabitants of Chinantla," which latter signifies a spot enclosed by cane hedges or palisades. By extension, the common term for "village" was *chinamitl*, as they were usually protected by such light defenses. The Chinantecs, therefore, as a nation, are known to us only by the name applied by their neighbors, the Aztecs, to their chief town.

The assertion of Orozco y Berra that they were also called *Tenes* arose from a misunderstanding of the letter of Hernando de Barrientos to Hernando Cortes (1521). Barrientos was not among the Chinantecs proper, but in another *chinamitl* in Chiapas.* Still other *Chinanteca* are mentioned as resident in Nicaragua. This Nahuatl word has absolutely no ethnographic significance.

Several authors have confounded these Chinanteca with the "Tzinacanteca," or Bat-people, a Maya tribe in Tabasco and Chiapas. The two are nowise related.

Location.—Their country was located in the mountains of the eastern portion of the State of Oaxaca and on the frontiers of the present State of Vera Cruz. Their neighbors on the north and east were Nahuatl speaking tribes, on the south the Zapotecs and Mistecs, and on the west the Mazatecs and Cuicatecs, the latter supposed to be a distant branch of the Zapotec stock. Within these boundaries was a wide variety of climate, ranging from the torrid vales of the *tierra caliente* up to the chilly regions of the high sierra, where we find one of their villages with the significant name "Holy Mary amid the Snows," Santa Maria de las Nieves. The village of Chinantla itself is situated in a wild and mountainous district where the climate is cool and rainy.† Orozco y Berra gives the names of thirty-four other towns inhabited by them.

History.—The Chinantecs are an extremely ancient people who have resided on the spot where the Spaniards found them from the earliest period of the traditional history of Mexico. We first hear of them as having been conquered by Ahuitzotzin, ruler of Mexico. This event according to the chronology of Torquemada, who is our authority for it,‡ took place in the year 1488.

They were treated by their conquerors with the utmost severity and cruelty, of which the historian Herrera cites several instances.§ They were glad, therefore, on the appearance of the Spaniards to throw off the yoke of the Mexicans and lend their aid to the invading strangers.

Culture.—The Chinantecs are described as a rude savage people, living in huts constructed of branches of trees, and devoid of the culture of their neighbors on either hand, the Zapotecs or the

* See the letter of Barrientos in the *Cartas y Relaciones de Hernando Cortes*. Edition of Don Pedro de Gayangos, Paris, 1866, pp. 204, 205 and notes.

† E. Mühlenpfordt, *Mejico*, Bd. ii, s. 214.

‡ Juan de Torquemada, *Monarquia Indiana*, Lib. ii, cap. lxiii.

§ *Historia de las Indias*, Dec. iii, Lib. iii, cap. xv.

Nahuas. Their principal weapon is said to have been lances of unusual length which they handled with singular dexterity

Literature.—The first to reduce the Chinantec language to writing was Brother Francisco Saravia. He was a native of Seville, in Spain, by trade a cabinetmaker, in that capacity he emigrated to the City of Mexico, where he married and carried on a prosperous business The death of his wife, when he was about thirty five years of age, led him to renounce the world, and in 1574 he joined the order of Dominicans Having been assigned to the province of Oaxaca, he devoted himself to studying the language of the Chinantecs, and in collecting them from the caves and ravines in which they lived into villages where they could cultivate the soil His success was great, and the natives regarded him with equal love and reverence. For fifty years of his long life he labored among them, and when he died in 1630, at the ripe age of a nonagenarian, he left in the archives of his order a number of MSS in and upon the language Of these we have the titles of a *Catecismo*, an *Arte*, a *Confesionario* and *Sermones*. Probably the most important was his *Gran Homilario Chinanteco*, a copy of which he placed in every one of the parishes under his care, so that the native sacristan could read the homily when the priest should be prevented from attending More interesting to the historian doubtless was his autobiographical sketch of the tribe written under the title *Noticia de la Conversion de la Nacion Chinanteca y sucesos acaecidos en ella al Autor*

I do not know of a single copy of any of Saravia's writings, and what is more remarkable, Father Nicholas de la Barreda, who precisely one hundred years after Saravia's death printed in Mexico the only known book in the language, had never even heard of his predecessor's labors, and states specifically in his Prologue that he had not found so much as a word written or printed in this tongue

Barreda himself is said to have been a native of Oaxaca, and began his missionary work among the Chinantecs about 1708 For a score of years he had been cura of San Pedro de Yolos, when his book appeared—*Doctrina Christiana en Lengua Chinanteca* (4to, Mexico, 1730) Of this only two copies are known to be extant, from one of which I possess a careful MS. copy by the hand of the late Dr C. Hermann Berendt This learned Americanist had commenced a study of the tongue, and left a few notes

upon it, which have also been of some service to me, although they are quite fragmentary.

The tongue is not included in Pimentel's *Cuadro Descriptivo de las Lenguas Indígenas de Mexico*, and there is no specimen of it accessible to students of linguistics. It appears, therefore, worth while to present a short description of its character; the more so as this seems different from many American tongues on account of the singular simplicity of its construction. In fact, I entertain some doubts whether Barreda's version represents correctly the idiom in its pure form. It certainly reveals no such difficulties as he speaks of, and resembles strongly a jargon in which inflections and syntactic relations have been reduced to their lowest terms. Several of the translations of the early missionaries have proved, on examination, to be in a jargon or trade language of a tribe, and not in its real speech. This may be the case here.

The Language.—The Chinantec tongue appears to have no affinity with any of its neighbors. It is described as guttural, rough in enunciation and difficult to learn. Barreda says in his Prologue that many of the priests assigned to parishes in the nation tried in vain to acquire it, and, failing in this, attempted to introduce the Nahuatl among the Chinantecs; and that this proving a failure, had asked for other fields of labor. He himself, after twenty years of study, had succeeded but moderately in mastering it, but adds that he had exercised the utmost care in translating the *Doctrina*, submitting every word in it to the most intelligent natives of his parish. The dialect he employed was that of Yolos, which differed, but not greatly, from that of other portions of the nation.

The pronouns are but slightly developed—a fact in marked contrast to most American tongues. The same form serves for both the personal and the possessive pronouns, and it is probable that there is no distinction between their singular and plural number, although a slight difference is sometimes indicated.

PRONOMINAL FORMS—PERSONAL AND POSSESSIVE.

I,	*na.*	We,	*naA.*
Thou,	*no,*	You,	*no.*
He,	*quia.*	They,	*quiaha*

It is noteworthy that the pronoun of the third person, *quia*, may be used for either the second or the first in its possessive sense; thus,

vi chaaqui quia, "for his sins," instead of *vi chaaqui na*, as a translation of "for my sins." So again, *animas quia*, as a translation of "our souls." This is analogous to the language of children, who do not clearly distinguish persons, and often refer to themselves in forms of the third person instead of the first

The interrogative is *he*, which also serves as a relative, and with the addition of the adverb of place, *la*, here, forms the demonstrative, *hela*, this, as *hela cna in*, "this first one" The demonstrative "that" is usually given by *da* or *nda*.

The indefinite pronoun *cha*, some, some one, somebody, is frequently prefixed, often apparently in a collective or distinctive sense, as *chañuh*, "some man" or men, *i. e.*, people in general; *charuhno*, "thy neighbor," *chasaquiun*, "somebody bad"—the devil; *chajhian*, "somebody else"

In all cases the possessive pronouns are suffixed to the nouns.

The verbal forms appear to vary considerably A terminal *e* or *a* appears to mark the infinitive, as *pane*, to chastise, *nguethna*, to kill. The imperative is characterized by the pronoun, as

Phua ha oala phua na.
Say thou as say I.

The reflexive has the pronoun before and after the verb.

Na juanh na.
Me bow I
(I bow myself)

The interrogative form is thus:

Cale cuihno ñuh quiaha?
Didst know thou man her?
(Didst thou know her husband?)
Ca-cuim-ba-na.
I did know him.'

In these sentences *ca* is the sign of the preterit, as again in the following sentence:

Ma ca mea testamento ñuh u?
Did thy father make a will?

Where the present form of the verb is *mea*, to make

PREPOSITIONS

The prepositions are properly such, being prefixed to the nouns, and separated from them

In, *ne*; as, *ne teke*, "in the belly;" *ne calis*, "in the calix" (sacred cup); *ne chaaqui*, "in sin."

On, *ni*; as, *ni altar*, "on the altar," *ni muiaui la*, "on this world."

Into, *lei*; as *hiñi lei gotan tan vino lei muian*, "(the) bread into flesh and (the) wine into blood."

Before, in the presence of, *quiani*; as *quiani jhian guecha*, "before other persons." Before, in time, *gian*.

After, in time, *quhin*.

Conjunctions.

And, *tan*.

Also, *jalabajna*; as, *jalabajna na ñina*, "also I am poor."

Numerals

	Cardinals.	Ordinals
1	*ona*,	*hela ona in*
2	*tno*,	*hela tno in*
3	*nne*, *nei*,	*hela nne in.*
4	*quiu*,	*hela quiu in*
5	*ña*,	*hela ña in*
6	*ñiu*,	*hela ñiu in*
7	*nyaa*,	*hela nyaa in.*
8	*ñna*,	*hela ñna in.*
9	*ñu*,	*hela ñu in*
10	*nya*,	*hela nya in*
20	*nyanya*	
40	*tno laa.*	
50	*tno laa nya.*	
60	*nne la.*	
70	*nne la nya.*	
80	*quiu la.*	
100	*ña la.*	
200	*nya la.*	

Texts.

The Lord's Prayer.

Thui ñuhu nah ñujui quinno, qualin ouiá hela ei-no; quahe
Lord father our heaven it in, may blessed that name-thy, come
nah ñujui quiche; quali heli hahà mugeula, jalabajna ñujui; quahe
us heaven thy, may that will earth on, also heaven, give
hi nah chahàchahà, tan ih-no chaaqui quies nuh, can jhiola in nah
bread us all the time, and wilt-thou sins forgive us, just as we

chaoaquiun quiani nah ; tan sa ton-no nah qüchi ui chaaqui ; qui mi nah
sins pardon against us ; and not thou us bring to sin ; take us
phui Dios gella he saquiu.
Lord God all this evil from.

Extract from the Doctrina of Barreda.

Porque se hizo hombre el hijo de Dios?	He vi calufiuhne Jna Dios?
Por librarnos de los manos del Demonio, y por redimir nos del pecado	Vi caquinne nah quaacha lin, tan vi caquinne nah ni chaa qui.
Que hizo Nuestro Señor Jesu Christo para librarnos?	He camoa phui nah Jesu Christo, vi caquinne nah?
Padeció muchos tormentos, fué crucificado, murió y fué sepultado.	Cangüinne fiule Juahui, cajanqua ni cruce, cajone, can cabanne
Que hizo nuestro Señor Jesu-Christo despues que murió?	He camea phuinah Jesu Christo, qua male jonne?
Al tercero dia despues que murió, resuscitó, y á las quarenta dias despues que resuscitó subió á los cielos y se sentó á la mano diestra de Dios padre todo poderoso	Nne mui qua male jonne, caguihi, tan ino la mui que male cagnihi cangaa na fiujui, tan cahuiaà quaa cha Dios mii gellaba li mea
Viendrá otra vez nuestro Señor Jesu Christo á este mundo?	Nijhea que ino phui nah Jesu Christo, mui cuila?
Otra vez hà de venir quando se acabe el mundo, á tomar cuenta á todos los vivos y muertos para darles el cielo para siempre á todos los que guardaron bien sus mandamientos, y á los que no los guardaron bien, les dará para siempre penas en el infierno.	Ona que, nijhea mui cha in mui cui, jhea quià quenta gellan cha zan, tan cha jon, cha queh fiujui gella muiba gellan cha ca hab quiu mandamiento quiaha ; tan hi chaza cabah quiu, queh gella muiba juahui nya jui.
Como murió nuestro Señor Jesu Christo?	Ihiala cajonne phui nah Jesu Christo?
Murió como hombre, no murió como Dios, porque Dios no puede morir	Cajonne calan cha, aza cajonne calan Dios, chavi Dios aza li jonne.
Si Dios no puede morir, como murió nuestro Señor Jesu Christo?	Ze Dios aza li jonne, ihiala ca jonne phui nah Jesu Christo?
Aunque nuestro Señor Jesu Christo era Dios, era tambien hombre, y asi pudó morir como hombre, y no pudó como Dios, porque Dios nunca puede morir.	Gui cu jua phui nah Jesu Christo yha Dios, ja hala jna yha fiuhne; viha jna le jonne calan chafiu, tan aza li jonne calan Dios ; chavi Dios aza li jonne jua lei que.

Quando muere la gente en este mundo, tambien mueren sus almas?

Ma jonnencha muiculla, jabala jua jon anima quiaha?

No mueren sus almas, sinó solamente el cuerpo muere; porque no puede morir el alma.

Aza jon anima quiaha, ma jua la ha gotamba jonne, vi aza li jon anima.

Y cuando muere el cuerpo, muere para siempre?

Tan ma jonne gotan, jonne cuaphue?

Nó puede morir para siempre, porque el dia que se acabe el mundo, resuscitaran todos los cuerpos, y se juntaron con sus almas, ya para nunca mas morir

Aza li jonne cuaphue geila mulba, vi quiaha mui cha la mulcui, jua tuo nigui cala geila gotan, tan nigui cuaha animas quiaha, vi aza jua cua li jonne.

Adonde van las animas de los defuntos quando mueren sus cuerpos?

Jhia cha animas cha jon ma jonne gotan quiaha?

Las animas de los buenos van al cielo para siempre, porque guardaron bien lo que manda la ley de Dios; y las almas de los malos van al infierno, porque no guardaron bien lo que manda la ley de Dios.

Animas chaqui va cha ñu jui geila mulba, chavi hah quiu he quiu hu tà ju quiaha Dios; tan animas cha zaquiun cha nya jui, chavi za hah quiu he quiu hutà ju quiaha Dios.

* * * * *

Que es cielo?

He ñu jui?

Cielo es un lugar lleno de mucho y grande gloria, lleno de todo genero de bienes, y de todo genero de alegria, en donde está Dios nuestro Señor, la Santisima Virgen, todos los Angeles y todos los Santos. Alli van las almas de los buenos que sirvieron á Dios á descansar para siempre, que nunca se podrá acabar

Nujui cua namba, canlè ñu phueli gloria; canlè cala geila juayauchij, thia nhuiaa phui nah Dios, za ñujui, geilan angeles, tan geilan santos. Nda cha animas chaquiun, cha camca ta quiaha Dios, ma hiae cala geila mulba, aza jua li chan.

English-Chinantec Vocabulary

Alive, *chasan*.

All, *geila*, *geilan*, *lagei*; *geila hejna*, "all these things," *geila bahimaa*, "all-powerful."

And, conj., *tan*.

Bad, *zaaquiu*, *saquiu*, *chaaquiu* (= not good).

Because, *chavi*.

Believe, to, *changa*.

Belly, *toho*; "in the belly of the virgin," *ño toho za muiane*

Bird, *ta*.

Blood, *muian*, *muien*; "by the blood," *muien no* (*mui* = water and woman).

Body, *gotan*; "in body and soul," *gotan tan anima quiaha*.

Boy, *guana*.

Bread, *hñi*.
Breast, *chij*.
Brother, *rua*.
Child, *yua*
Day, *muiba*
Dead, *ma jon*, *cha-jon*.
Devil, *sequiun* (see "bad"); *chahin* (see "sick").
Die, to, *jon-no*.
Drink, to, *nguhu*.
Ear, (*la*)*quaha*
Earth, *muyrui*.
Eat, to, *cuhu*.
Eye, *manihi*.
False, a lie, *asacha* (= not true)
Father, *ñuh* (= man); *mii*; *Dios mii*, "God the Father"
Fire, *ghi*
Foot, *tehi*.
Full, *canib*
Girl, *mui yua* (= female child)
Give, to, *qua*, *qua ha*.
Good, *quiu*.
Grandfather, *nguh*.
Grandmother, *nyaa*.
Great, *phua*, superlative, *ñu phuaii*.
Hand, *quaha*; "open thy hands," *janquaha!* "In thy hands I place my soul," *nqu tha na animaquia*.
Head, *gui*, "throw water on the head of the child," *yaha mui ni gui yua*.
Heart, *haha*.
Heaven, *ñujui*, *nahui*.
Hell, *nyejui*.
Herb, *ha*.
House, *nu*.
How, *jhiala*, *sala*; how long, *ja mui*.
Husband, *ñuquia* (= consecrated man, *i. e.*, by the Church)
If, *se*.
Infant, *chimina*
Join, to, *sua* (= to marry)
Know, to (saber), *ñih*
Know, to (conocer), *cwih*.
Kill, to, *nguelhna*.
Live, to, *can*.
Magician, *gin*.
Make, to (Span. hacer), *mea*.
Man, *ñuh*, *cha-nu*
Meat, flesh, *gno*
Money, *cu*
Month, *sei*.
Moon, *sei*.
Mother, *sa*, *saha*
Mountain, hill, *maa*
Much, *ñu*, *ñula*.
Name, *ai*, *hi ai no?* "What (is) thy name?"
Nephew, niece, *nyaa*
No, *asa*, *sa*.
Nothing, *asa-ha*.
Now, *na*.
Or, *qua*.
Pay, to, *qui-hi*, *quei*.
Place, *namba*.
Poor, *ñin*, *ñina*
Pudenda feminæ, *yuh*
Pudenda viri, *cau*.
Relation, a, *ruh*, *rua* (= brother)
Shoulder, *ch*.
Sick, *chah*.
Sin, *chaaqui*.
Small, little, *miha*.
Son, *jaa*.
Soon, *naba*.
Speak, to, *phua*.
Steal, to, *dohi*.
Stick, wood, *ma*
Stone, *cau*.
Sun, *mañui*.
Tears, *mui nii* (= water, eyes)
Town, *jui*.
True, *cha*.
Uncle, aunt, *haaya*
Virgin, *muinas* (v. woman).
Water, *mui*.
When, *ma*.
Where, *jhia*.
Wife, *muiquia* (see "husband")

With, *onaha.*
Wizard, *lan.*
Woman, *mui*, *cho-mui.*
Word, *ju*; *ona ju*, "one word"
Work, to, *ta.*
Year, *gui.*
Yes, *ma*, *jna*, *ma* (*iba* = it is)

On the Mazatec Language of Mexico and its Affinities

By Daniel G. Brinton, M D

(*Read before the American Philosophical Society, January 15, 1892*)

In the northeastern corner of the State of Oaxaca lies a mountainous tract, watered by numerous streams, known from earliest times by its Aztec name *Teutitlan*, the Divine Land, or The Land of the Gods, and officially now as the district Teutitlan del Camino It has about 26,000 inhabitants, a large proportion of whom are of native blood. These speak three radically different languages—the Cuicatec, which is probably a dialect of the Zapotecan stock; the Chinantec, which stands alone, and the Mazatec, of which nothing whatever has been known, and which it is my aim to examine and, if possible, classify in the present study.

The material I have for the purpose is an unpublished vocabulary, collected by a Danish officer, who was in the service of Maximilian, and which has been obligingly furnished me by Mr Alphonse Pinart, whose extensive researches in American linguistics are well known The only published materials in existence are two translations of the Lord's Prayer into different dialects of the tongue These have been reprinted by Pimentel, Bancroft and other writers. Their precise provenance is unknown, as for the vocabulary, it was obtained at Huautla, northeast of the town of Teutitlan.

Names.—The name Mazatecatl—plural, Mazateca—means "Deer People" in the Aztec or Nahuatl language. It may have been given them by their Nahuatl neighbors on account of their land abounding in deer, or, as some say, because they worshiped the figure of a deer—that is, had a deer totem among them. There were other Mazatecas living in the present State of Tabasco, and yet others in the State of Guerrero, but we have no reason to suppose that those "Deer Peoples" were at all related to these in Teutitlan. What they called themselves, if they had a collective tribal name, we do not know.

Nor is it certain why their country was referred to by the Aztecs as "The Land of the Gods." It seems likely that it was on account of the numerous temples that existed there, and the unusually devotional character of the natives. The remains of these ancient religious structures and of the artificial mounds which supported them still bear witness to this, and two of their villages yet bear the names San Antonio de los Cues and San Juan de los Cues, the term *cues* (a Haytian word) being applied by the Spaniards to artificial mounds. The former is situated in the valley of the Rio Salado; the latter in an adjacent valley. Unfortunately, no archæological exploration of them has been reported.*

Their religious character is also referred to by the early Spanish writers. Sahagun describes them as performing remarkable tricks at certain festivals, such as swallowing live snakes and frogs.† Mendieta speaks of their rigid fasts and abstinence from marital relations for fifteen days after the nuptials. The historian Herrera gives the following description of some of their rites:

"In the Province of Teutitlan, where the Mazatec language is spoken, which adjoined that of the Mistecs, they were accustomed to flay the sacrificial victims, and carried the skins to the neighboring villages, asking alms. On the day of a certain important festival, which took place annually, the priests ascended the temple and struck a war drum. At this signal all the Indians who were in the fields had to run to their houses and their town. Then those who had carried the skins of the victims sallied forth and ran about the country till midday, and whenever they caught a person they cut his hair so as to form a sort of crown around his head, and such persons were destined to be sacrificed within one year."‡

According to Aztec mythology—which is very rarely to be regarded as historical—the natives of Teutitlan were descended from Xelhua, the oldest of the six sons of Iztac Mixcohuatl and his wife, Ilancuey, the venerable pair who dwelt in and ruled the mysterious northern Land of the Seven Caves, called in Nahuatl Chicomoztoc.§

* Another Teotitlan—"Teotitlan del Valle"—is found in Oaxaca. It was so called from the temple of a famous divinity, which was erected on the summit of a high rock near by. This was the goal of numerous pilgrims, and, according to Señor J. B. Carriedo, "*fué uno de los santuarios de mas estima y de mas nombre en la gentilidad.*" *Estudios Historicos del Estado Oaxaqueño.* Tom. I, pp. 13, 14.

† *Historia de Nueva España.* Lib. ii, Apendice.

‡ *Historia de las Indias Occidentales*, Dec. iii, Lib. iii, cap. 16.

§ Mendieta, *Historia Eclesiastica Indiana*, Lib. ii, cap. 33.

This Xelhua was a mighty man—one of the "Giants,"—and was surnamed the Builder, for he it was who constructed the famous Pyramid of Cholula. He is also referred to as chief of the Olmeca, an unknown, ancient people.

We need attach little importance to these old stories, and will find it more profitable to turn to the language of the Mazatecas to discover their affiliations.

In investigating its possible analogies with other idioms, I have been somewhat surprised at the relationships which it certainly discloses. These are not with the Zapotec-Mixtec stock, as I have (erroneously) stated in my work, *The American Race*,* but with two quite remote and independent stocks.

The one of these is the Chapanec, which was spoken in the present State of Chiapas, and also at the time of the conquest by many thousand natives, who occupied the shores of Lake Managua and Fonseca Bay, in Nicaragua, where they were known as Mangues and Orotinans. The dialects of this stock are closely akin to each other.

The second list of affinities point to a still more remote and unexpected relationship. The Mangues had as neighbors beyond the Cordilleras, in Costa Rica, a group of related tribes—the Talamancas, Borucas, Bribris, Vizeitas, etc., whom I shall call, collectively, "Costa Rican" These have been satisfactorily shown by Dr. Max Uhle, Dr. A. Ernst and other students to be not distantly connected with the important Chibcha stem of New Granada, which, at the conquest, was widely extended over that Province, and is the only linguistic stock of South America whose presence in North America has been proved †

After presenting the vocabulary furnished me by Mr. Pinart and the texts offered by Pimentel I shall pursue the comparisons of the stock of terms thus supplied.

ENGLISH–MAZATECAN VOCABULARY

Arm, *chala.*	Black, *tasa.*
Bad, *minda.*	Blue, *ise.*
Banana, *nacha'.*	Boy, *indidi* (see "Son")
Beans, *nahma'.*	Bread, *chu hi.*
Beard, *tsa' á.*	Breast (chest), *animale.*

* *The American Race: A Linguistic Classification and Ethnographic Description of the Native Tribes of North and South America*, p. 142 (New York, 1891).

† See *The American Race*, pp. 184-186.

Brown, *sohene'*
Cactus, *nan' da.*
Cat, a, *chito*
Chief, *chicunai.*
Church, *inai.*
Clothing, *nikya.*
Clouds, *ifi.*
Cow, *ngohaha'.*
Daughter, *tsadi* (see "Girl")
Day, *guniahi.*
Dead, *coviu*
Die, to, *cuiyane.*
Dog, *nanya.*
Door, *chutoa*
Ear, *sohicai.*
Earth, *nangi*
Egg, *cho'*
Evening, *gicho*
Eye, *schoa*
Eyebrows, *tsa tapon* (?)
Father, *tata.*
Finger, *noon-tsa* (see "Hand").
Fire, *nii.*
Foot, *tsoco*
Forehead, *tsu*
Girl, *tsadi.*
God, *naina'*
Gold, *naleto*
Good, *dani.*
Green, *tsare'*
Hail, *tsinayo*
Hair, *cosha'*
Hand, *tsa*
Hat, *tsingye.*
Head, *tku.*
Heaven, *gami.*
Here, *ihndi.*
Hill, *nindo*
Iron, *guicha.*
Large, *tsaa.*
Leaf, *sohcatiya* (= ear-tree).
Light, *asa'*
Lightning, *kuata.*
Lungs, *nyasi.*
Maize, *name'.*
Man, *chii.*
Meat, *yeje.*
Money, *to.*
Moon, *sa.*
Morning, *tanhye*
Mouth, *tsoa.*
Night, *nhyu*
Nose, *nitu.*
Onion, *tatse*
Palm, *sahaha'*
Paper, *sohuhu'*
Plantain, *nacha'.*
Plate, *titsi.*
Pretty, *da.*
Rain, *tsi.*
Red, *ini.*
River, *dahoe.*
Road, *diya.*
Sea, *dachicu.*
Sheep, *chitsanga*
Sierra, *gihya*
Silver, *tonsahua*
Small, *tua*
Snow, *dandya*
Son, *indi* (see "Boy")
Star, *ninguisea.*
Stone, *noye*
Summit, the, *garenindo*
Sun, *nai.*
Teeth, *niiyu.*
There, *hani.*
Thigh, *ahamda.*
Toe, *noonisoco* (see "Foot").
Tree, *iya*
Tobacco, *nahnu*
To-day, *gandai.*
Tomato, *chiti*
Town, *naschananda*
Turkey buzzard, *nihye*
Ugly, *ahiu.*
Water, *nanda.*
White, *chuhua.*
Wind, *to.*
Woman, *chu.*
Year, *guno*
Yellow, *sina.*
Yesterday, *gohia.*

The personal pronouns are:

I, *gáa'*	We, *gahí.*
Thou, *gahyé'.*	You, *gahiní.*
He, *he,*	They, *ntahne'*

Of the possessives I find the following

Mine, *na.*	His, *le'*
Thine, *li.*	Our, *nahan.*

The numerals are given thus:

1	*go'*	8	*hí.*
2	*ho'.*	9	*nyaha'*
3	*ha'.*	10	*te.*
4	*níhu'*	11	*tengo.*
5	*ú*	15	*chu.*
6	*hú'*	20	*cung*
7	*yato'*	80	*kate.*

There are two versions of the Lord's Prayer given in Pimentel's *Cuadro Descriptivo de las Lenguas de Mexico* They evidently have been made by different persons, and represent different dialects of the tongue, and apparently neither is in that of Huantla, where the vocabulary was obtained. Both, however, are clearly Mazatec, and the differences disappear considerably on analysis.

They are as follows:

A.

"*Nadmina naina ga tecni gahami, sandums tls gatirrubanajin nanguiti, cuaha catama janimali, jacunit dic nangui cunit gahami, niño rrajinna tey quitaha najin qntedchatahanajin gadchidtonajin jacunitgajin nedchata alejin chidtaga tedtunajin guquimttacuntuajin, tued tinajin cuacha catama*"

B

"*Tata nahan, xi nacá nihaseno: chacua catoma ñiere catichová rico manimajin: catoma cuasuare, donjara batob cornangui, batece nihasen: niotisla najin ri gancihinixtin, tinto najin dehi · ni canuhi ri guitenajin donjara batoo, juirin ni canojin ri quiteisajin. quiniquenahi najin ri danjin quisanda nongo niqueste Met*"

Referring to the first as A and the second as B we may make the following comparisons with words in the Vocabulary:

	A.	B.	Vocab.
Our,	*naina,*	*nahan,*	*nahan.*
Father,	*nadmina,*	*tata,*	*nami* ("ours").
Thou,	*ga,*	*naod,*	*gahyá.*
Heaven,	*gahami,*	*mhaseme,*	*gami.*
Earth,	*nangui,*	*nangui,*	*nangi.*
Kingdom (thy),	*janima-li,*	*mandima-jin.*	
Give (thou),	*niño,*	*nio-tiila.*	
To-day,		*ganei,*	*gandei.*
Us (= to us, of us),	*najin,*	*najin.*	

Turning now to an investigation of the affinities of the Mazatecan, I present the following arrangement of a number of words, with their corresponding terms, in dialects either of the Chapanecan or Chibchan stock. It is noteworthy that very rarely do we find any word which is at all alike in the three. The Mazatecan terms seem to have been derived from two sources radically dissimilar.

Comparison of the Mazatec with the Chapanecan and Chibchan Stocks.

			Chibchan.	
	Mazatec	Chapanecan.	Costa Rican	New Granadian.
Arm,	*ahala,*	*golea, ghulua*		
Banana,	*nacha,*	*noko-tona*		
Black,	*tuna,*		*turinat,*	*funsa.*
Blue,	*tao,*		*dahke, siona.*	
Breast,	*animala,*		*aniarmi, V.*	
Cat,	*ckite,*	*tsitu.*		
Chief,	*chicumu,*			*chiquy* (priest).
Dead,	*covis,*	*coūme*		
Die, to,	*end-yana,*	*hui.*		
Dog,	*nanga,*	*nombi.*		
Ear,	*schicai,*		*sakuke, ikuaga,*	*guhyca.*
Eye,	*sohou,*		*coua, s'dowe,*	*upcua.*
Fire,	*nii,*	*nio*		
Flesh,	*yoja,*	*nbohoui.*		
Foot,	*tscco,*		*tsuku-ucluua, V.*	
Good,	*dani,*	*pami, gama.*		
Hair,	*coshi,*		*sahi,*	*gaghi.*

	Mazatec.	Chapanecan.	Chibchan Costa Rican.	Chibchan New Granadan.
Hand,	*tea*,			*yta*.
Head,	*tku*,	*tahma*.		
Here,	*tendi*,	*jonda*.		
Hill,	*ninde*,	*ndili*.		
Hilltop,	*garominde*,	*namando*.		
Lightning,	*kuata*,	*hotia-pumona*. (thunder)		
Maize,	*nama*,	*nama*.		
Man,	*chii*,		*hochicha*.	
Money,	*to*,	*tu-ani*.		
Moon,	*sa*,		*sé, sia*,	*sa* (night).
Mouth,	*tsoa*,	*dutti*.		
Mountain,	*gihya*,	*gua*.		
Night,	*nhyu*,	*nyufui*.		
Nose,	*nitu*,	*nyungu*.		
Rain,	*tsi*,			*sie*.
Red,	*ini*,		*bets-ena, serir-ina*.	
River,	*dahoa*,	*ndju*.		
Road,	*diya*,	*ndla*.		
Sea,	*dachiou*,		*deche, dechequ-in*.	
Small,	*tua*,		*tsoua-pa*, *T*.	
Star,	*ninguitsa*,	*nafuiti*.		
Stone,	*noyo*,	*nyugu, nooa*.		
Sun,	*sui*,		*chui*,	*sua*.
Teeth,	*niiyu*,	*nji*.		
There,	*kani*,	*ti-ha*.		
Tree,	*iya*,	*nya*.		
Turkey buzzard,	*ndiya*,	*nohutu*.		
Water,	*nanda*, (stream)	*nanda*.		
White,	*ohuhua*,		*suruna, suai*.	
Wind,	*te*,	*tiho*		
Woman,	*chu*,		*soora*,	*sua, gui*
Yellow,	*sine*,		*pai, shoin-ora*.	
I,	*gii*,	*saho*.		
My,	*na*,	*nho*.		
One,	*gó*,	*ti-ghi, ticaó*		
Two,	*hó*,	*haó*		
Three,	*hi*,	*haui*.		

I think that the above comparison will leave no doubt but that the Mazatec is affiliated with both these stocks. With regard to

the Chapanecan, no other supposition will explain the substantial identity of the words for:

Fire,	*nii*	and	*nio.*
Water,	*nanda*	and	*nanda* (stream)
Maize,	*nama*	and	*nama.*
Tree,	*iya*	and	*nya.*
Lightning,	*kuato*	and	*koita.*
Night,	*nhyu*	and	*nyu-fui.*
Teeth,	*niyu*	and	*nija.*
Stone,	*noyo*	and	*nyugu.*
Cat,	*chito*	and	*tzitu*
Here,	*ikndi*	and	*jando.*
One,	*pó*	and	*tioaó.*
Two,	*hó*	and	*háó.*
Three,	*há*	and	*háui.*

Not less positive are the identities of the following words of the Mazatecan and Chibchan (Costa Rican) groups:

Sun,	*sui*	with	*chui* or *sua.*
Moon,	*sa*	with	*só, sio* (or *se*)
Ear,	*schical*	with	*guhyca, sahuke.*
Eye,	*schcu*	with	*s'bove, bcua.*
Hair,	*coshó*	with	*schá, quyhá*
Man,	*chi*	with	*ke chi-cha.*
Woman,	*chu*	with	*sue, güi.*
Rain,	*tsi*	with	*siu*
Sea,	*dochicu*	with	*dochequ-in.*
Foot,	*tsoco*	with	*touku.*

The words for the colors white, black, blue, yellow and red show rather remote, but, perhaps, actual resemblances. They have no analogy whatever with the Chapanecan color terms.

The ethnographic conclusion to which this comparison would lead us that the Mazatecas do not constitute an independent stock, but a branch of the Chapanec group, which was at some early date of its history largely infiltrated with blood of the Costa Rican tribes of South American descent. This may have arisen from the adoption of some large band, which had migrated across the mountains separating Costa Rica from Nicaragua. The Mangue branch of the Chapanecs lived in Nicaragua, in immediate proximity to these mountains, and must have been in frequent relations with the tribes beyond them.

But how explain the extensive journey from Nicaragua to the northern limits of the State of Oaxaca? Here an ancient tradition of the Mangues comes to our aid It was preserved by Father Remesal in his *History of Chiapas*, and runs to the effect that at a remote time a considerable number of the Mangues departed from the shores of Lake Managua and journeyed to the north, into the territory of the Zoques. Remesal construed this to explain the origin of the Chapanecs of Chiapas, but the traditions of the latter do not acknowledge this derivation, and it is probable that the Mangues referred to some other division of their community This may well have been that which conveyed a mixed dialect of Mangue and Costa Rican as far as the northern borders of Oaxaca.

We have also early evidence that a band of the Mangues, numbering about four hundred souls, occupied a town in the midst of the Costa Rican tribes, in the valley of Guaymi, fronting on the Golfo Dolce. There they were found by the Spanish explorers in 1563 * Doubtless they absorbed more or less of the language of their rulers, the Guaymis, and the following identities between the Mazatecan and the Guaymi vocabularies (published by Mr Pinart in the *Revue d' Ethnographie*, 1887) seem conclusive

	MAZATECAN	GUAYMI.
Sun,	*tsui*,	*shui.*
Moon,	*aa*,	*so.*
Head,	*tku*,	*θokua.*
Nose,	*nito*,	*nido-ñ.*

If these identifications are correct, they enable us to trace the influence of a South American linguistic stock as far into North America as the northern border of Oaxaca—a discovery full of significance for the history of the aboriginal culture of the central portion of the continent.

* Peralta, *Costa Rica, Nicaragua y Panama en el Siglo XVI*, p. 777 (Madrid, 1883).

On the Taxonomy of the Genus Emys, C. Duméril.

By Dr. G. Baur, Clark University, Worcester, Mass.

(Read before the American Philosophical Society, January 1, 1892.)

I have just read Prof. L. Vaillant's paper, "Sur la Signification taxinomique du Genre Emys, C. Duméril" ("Ann. Sc. Nat. Zool. et Pal.," vii^e série, Tome xii, No. 1, Paris, 1891, pp. 51–69). Prof. Vaillant attempts to show that the type of Emys is not *Emys orbicularis* L., as nearly generally admitted lately, but *Testudo picta* Schneider, now generally known under the name of *Chrysemys picta*, and I think he is correct in this. I am, however, unable to follow him in all his other conclusions. I should like to add first, that the name proposed by Brogniart in manuscript, before Duméril had used the French name, les Emydes, in 1804, had been "*Syrinx*." In Isidore Geoffroy Saint-Hilair's paper on Trionyx, published in 1809, in "Ann. du Mus. d'Hist. Nat., Paris," Vol. xiv, I find the following note on page 3: "On lisoit dans le manuscrit demeuré au secrétariat de l'Institut jusqu'à la publication du volume des Savans étrangers le nom de *syrinx* au lieu de celui d'émyde, mais M. Duméril ayant depuis proposé ce dernier nom, M. Brogniart l'adopta lors de l'impression de son Mémoire."

Besides, I should like to state that the original paper of Brogniart, "Essai d'une classification naturelle des Reptiles," appeared for the first time in 1799, in the "Magazin encyclopédique, ou Journal des Sciences, des Lettres et des Arts," rédigé par A. L. Millin, Vol. vi, pp. 184–201, An viii, 1799, and was reprinted in the "Bulletin des Sciences, par la Société Philomatique," No. 35, pp. 81, 82, Paris, Pluviose, an 8 de la République, and No. 36, pp. 89–91, pl. vi, Ventose, an 8 de la République (1800).

It was Michael Oppel* who, for the first time, used the fact already noticed by Schöpff, that in *Emys orbicularis* the front portion of the plastron is movable, to distinguish in the genus Emys three subdivisions.

"Subdivisiones secundum scriptores recentissimos.

"(*a*) Sterno antice mobili, *e.g.*, *Emys lutaria*.

"(*b*) Sterno cruciformi, *e.g.*, *E. serpentina*.

"(*c*) Collo longissimo, sub testam arcuate reflexa, non retractili, *e.g.*, *E. longicollis*."

E. serpentina was placed in a new genus, *Chelydra*, by Schweigger, in 1812 ("Königsberger Archiv für Naturwissenschaft und Mathematic," Vol. i, pp. 290, 292, 293, Königsberg, 1812),† and *E. longicollis* in the new genus *Chelodina*, by Fitzinger, in 1826.‡

* Oppel, Michael, "Die Ordnungen, Familien und Gattungen der Reptilien," München, 1811, p. 11.

† This is the original publication.

‡ Fitzinger, L. T., "Neue Classification der Reptilien," Wien, 1826, p. 6.

Brongniart, who proposed the Latin name "Emydes" in 1805 for Duméril's French name "les Emydes," had given the following species as belonging to it: *E. ferox*, *E. rostrata*, *E. matamata*, *E. lutaria*, *E. pennsylvanica*, *E. clausa*.

E. ferox and *E. rostrata* belong to *Trionyx* Geoffroy, 1809, *E. matamata* to *Chelus* Duméril, 1806, *Chelys* Oppel, 1811

It was Merrem * who divided the remaining species of Emys into two groups.†

(a) *Emys*—

"Digiti distincti, unguibus acutis.
Rostrum corneum
Sternum immobile."

* Merrem, Blasius, "Versuch eines Systems der Amphibien," Marburg, 1820, pp. 22, 27. Merrem places the *Testudo lutaria*, with the following synonyms *Testudo lutaria* L., *T. orbicularis* (?) L., *T. europaea* Schneid., *T. caspica* Gmel, among his Emys, not knowing that in this form the anterior part of the plastron is movable

† I have to say, however, that Rafinesque had already, five years before, reached the same conclusion in a book which is very rare, but of which my friend, Mr S Garman, has a copy. I have to thank Mr Garman for copying for me the part relating to the Testudinata. The title of the book is "Analyse de la Nature ou Tableau de l'Univers et des corps organisés," Palermo, 1815. On page 75 we find

"*Cryptopia*. Les Cryptephiens.

"Carapace inférieure à 1 ou 2 valves mobiles, enfermant les membres comme dans une boîte.

"G 3, *Cheliphus* R., 4. *Uronyx* R.; 5. *Didicla* R., 6. *Monoclida* R.

"*Emydania* Les Emydiens.

"Carapace ni coriace, ni à valves mobiles, pieds à doigts libres ou palmés.

"G 7, *Emyda* R., *Emys* Dum, 8. *Chemelys* R.; 9. *Chelopus* R, 10. *Chelydra* R, *Chelys* Dum, 11. *Chelurus* R"

Unfortunately Rafinesque did not give the names of any species with the new genera, nor did he give any characters. From a later paper, which was written in 1816, but not published before 1832, we receive some information by Rafinesque (Rafinesque, C. F., "Description of Two New Genera of Soft shell Turtles of North America,' *Atlantic Journal and Friend of Knowledge*, Vol 1, No 2, Philadelphia, summer of 1832, pp 64, 65.

"*Cheliphus* Raf Water turtles with valved shells, 5 claws and toes to all the feet.

"*Uronyx* Raf. An anterior valve to the shell, toes and claws 5 and 4, tail with a claw *T. scorpioides*, etc.

"*Didicla* Raf Bivalve lower shell, toes 5 and 4. Type *T. clausa*, *odorata*, etc

"*Monoclida* Raf. Lower shell valvular anteriorly, toes 5 and 4. *T. retzi* (?), etc

"*Chemelys* Raf. Warty scales, no valves, 4 toes to all the feet. *T. verrucosa*, etc.

"*Chelopus* Raf No valve, toes not palmated 4 and 5. *T. punctata*, etc.

"*Chelurus* Raf No valves, feet palmated, a long scaly tail *T. serpentina*, etc."

The group with movable valves, named Cryptephia by Rafinesque, contains, therefore, the genera *Sternothaerus* = Cheliphus, *Cinosternum* = Uronyx = Monoclida, *Cistudo* = Didicla, part.

The group in which the valves are not movable, named *Emydania* by Rafinesque, contains the genera *Emys* = Emyda, *Clemmys* = Chemelys = Chelopus; *Chelydra* = Chelurus.

(*b*) *Terrapene*—

"*Digiti distincti, unguibus acutis.*
Rostrum corneum.
Sterni lobo anteriore, aut utroque mobili."

Two years later, in 1822, Fleming established the genus *Cistuda* * for the tortoises, in which the entrance to the cavity is formed by a lid. *Cistuda* is simply a synonym of Merrem's *Terrapene*, and has to be abandoned therefore

In 1825, Gray† follows Merrem, adopting the genera Emys and Terrapene (written Terraphene), "*Cistuda* Say" is declared a synonym of *Terrapene*

In the same year Bell ‡ published an important paper not mentioned by Prof Vaillant, in which he shows that *T. europæa* Schneid. (*orbicularis* L) has to be included in "*Terrapene* Merrem, *Cistuda* Say." He says of *T orbicularis* L. "On examining sometime since a shell of this species, the first I had seen, which had lost the sternum, I was struck with the appearance of the articular surface from which that part had been removed, and immediately concluded that it must belong to the present group, having a movable breastplate, notwithstanding Merrem, to whom belongs the credit of having separated the 'Box Tortoises' under his subgeneric division Terrapene, retains this species amongst his Emydes, the character of which, on contradistinction to *Terrapene*, is that the sternum is entire and fixed. On consulting Schöpff, I found that, with his usual accuracy, that author had mentioned the movable structure of the sternum, and subsequent observations have established my first conjecture that it belongs to this genus"

Now this leaves no doubt whatever that from 1825 the name Emys could not be applied to T orbicularis L., but that this species belonged to Terrapene, and since Terrapene Merrem is the same as Oppel's subdivision, with Emys lutaria as type, this species, which is now known as E orbicularis L., has to be considered the type of Terrapene

Gray § follows Bell in 1831, but uses now the name *Cistuda* of Fleming, which he calls *Cistuda* Gray, not Cistudo as remarked by Prof Vaillant

* It is difficult to say whether this name *Cistuda* is a misprint or not. It could either stand for *Cistula*, from *cista*, the diminutivum of *cista*, which means a small box, or for *Cistudo*, formed in the same way as *Testudo* from *testa*. It seems that Duméril and Bibron introduced the name Cistudo for the first time in 1835.

† Gray, John Edward, "A Synopsis of the Genera of Reptiles and Amphibia," "Ann. of Philos." Vol ix, pp 210-232, London, 1825.

‡ Bell, Thomas, "A Monograph of the Tortoises, having a Movable Sternum, with Remarks on their Arrangement and Affinities," *Zoolog Journ*, Vol II, pp 299-310, London, 1825.

§ Gray, J E., 'A Synopsis of the Species of the Class Reptilia," p 7, published as Appendix to Vol ix of Cuvier's "Animal Kingdom," edited by Edward Griffith, London, 1831 In the same year appeared another separate edition, with additions; Gray, John Edward, "Synopsis Reptilium, or Short Descriptions of the Species of Reptiles," London, 1831. The original paper was written October, 1830; the second edition of it in January, 1831.

In 1828, Ritgen* subdivided the genus *Emys*, in *Emys* and *Clemmys*, and retained *Terrapene* Merrem.

The following species are united with *Clemmys* : *E punctata*, *planiceps*, *glutinata*, *centrata*, *subrufa*, *melanocephala*. Of these *E punctata* Schöpff = *T. guttata* Schneider, has to be considered as type.

As correctly stated by Prof Vaillant, *T. picta* Schn. has to be considered as type of Emys, and *Chrysemys* Gray, 1844, becomes therefore a synonym of Emys.

The first author who subdivided the *Terrapene* Merrem, as limited by Bell in 1825, was C. L Bonaparte,† who separated the American box tortoises under Fleming's name *Cistuda* in 1830 and 1831, from Emys, with *T* *orbicularis* as the type

In 1836, Fitzinger proposed a new name, *Pyxidemys*, to contain the following species : *T. carolina* L. (*T* *schneideri* Schweigg , *T* *virgulata* Daud), *Sternothaerus trifasciatus* Bell, and *T. amboinensis* Daud If there would be an objection to the name Cistuda in the sense of Bonaparte, Fitzinger's name *Pyxidemys* ought to be used with the *T* *carolina* L. as type. But I think it will be the best to use the name *Cistuda* in the correct form of *Cistudo*

As a result we have the following

Emys C Duméril, s. str	= Chrysemys (Gray),	Type	*T* *picta* Schneider
Terrapene Merrem	= Emys (Boul)	"	*T. orbicularis* Lin.
Cistudo Bonap non Flem.	= Cistudo (Boul)	"	*T* *carolina* Lin.
Cyclemys Bell	= Cyclemys (Boul)	"	*E* *Dhor* Gray
Clemmys Ritgen	= Clemmys part (Boul.)	"	*T* *guttata* Schn

I have shown some time ago that in *Cistudo major* Agassiz, the zygomatic arch is complete (*Science*, April 3, 1891, p. 190), as in *T* *amboinensis* Daud., notwithstanding I believe that the Asiatic and American forms are generically separate I am unable to say whether *T* *amboinensis* Daud. belongs to the genus *Cyclemys* Bell, with *E. Dhor* Gray as type, or not. Prof. Vaillant is inclined to place *T* *amboinensis* in a genus distinct from *Cyclemys* Bell, for which he uses the name Terrapene The correct name would be *Cuora* Gray, introduced in 1855

The whole question relating to the taxonomy of Emys Duméril may be developed in the following table

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* "Ritgen, F. A., Versuch *einer natürlichen Eintheilung der* Amphibien," "Nova Acta Nat. Cur ," Vol. xiv, pp. 257–284, Bonn, 1828.

† Bonaparte, C L., "Osservazioni sulla seconda edizione del Regno Animale del Barone Cuvier," Bologna, 1830 And "Saggio di una distribuzione metodica degli Animali Vertebrati Giornale Arcadico di Scienze," etc., Roma, Vol. xlix, 1831

Emys C. Duméril, 1806.

Emys C. Duméril (Oppel, 1811).

Emys (*subdivisio*) A. Anterior part of plastron movable. Type *T. orbicularis* L. Oppel, 1811.

Emys C. Duméril (Merrem, 1820), including *T. orbicularis* L.

Terrapene Merrem, 1820.

Emys C. Duméril (Gray, 1825).

Terrapene Merrem (Bell, 1825), including the original type *T. orbicularis* L., of Oppel.

Emys C. Dum. Type *T. picta* Schn.

Clemmys Ritgen, 1828. Type *T. guttata* Schn.

Terrapene Merrem (Bell).

Cistuda Bonap., 1830. Type *T. carolina* L.

Terrapene Merr. Type *T. orbicularis* L.

Cistudo. Type *T. carolina* L.

Cyclemys Bell, 1834. Type *E. dhor* Gray.

I place now the views of Boulenger, Vaillant and myself together:

Baur	*Vaillant.*	*Boulenger*
Emys C. Dum., s. str. Type *T. picta* (Hermn. MSS.) Schn.	*Emys* C. Dum., s. str. Type *Emys picta* Schöpff.	*Chrysemys.*
Clemmys Ritgen. Type *T. guttata* Schn.		*Clemmys*
Terrapene Merrem. Type *T. orbicularis* L.	*Cistudo* Gray. Type *Cistudo orbicularis* L.	*Emys.*
Cistudo (Cistuda Flem.) Bonap. Type *T. carolina* L.		*Cistudo.*
Cyclemys Bell. Type *Emys Dhor* Gray.	*Cyclemys* Bell. Type *Cyclemys dhor* Gray.	*Cyclemys*, part.
Cuora Gray. Type *T. amboinensis* Daud.	*Terrapene* Merrem. Type *Terrapene amboinensis* Daud.	*Cyclemys*, part.

The only modification in Boulenger's catalogue necessary is to change his *Chrysemys* in *Emys*, and his *Emys* in *Terrapene*.

Studies in South American Native Languages.

By Daniel G. Brinton, M.D.

(Read before the American Philosophical Society, February 5, 1892.)

INTRODUCTORY.

It is not too much to say that the languages of the native tribes of South America are the least known of any on the globe. The problems they present in their grammatical character and affinities remain the furthest from solution, and the materials to undertake such a task are the scantiest from any equal area on the earth's surface. In spite of the labors of such earnest workers as Von den Steinen, Ehrenreich, Adam, Ernst, Darapsky, Middendorff and others, there are numerous tongues of which we know absolutely nothing, or have but bare and imperfect vocabularies.

In the present series of studies I present a variety of material from either unpublished or rare works, accompanied by such suggestions as to its character and relations as have occurred to me in its preparation, and by some observations on the ethnography of the tribes mentioned. As I am convinced that the only ethnographic classification possible of the native tribes of America is that based on language, I do not hesitate to apply this whenever possible.

I.

THE TACANA GROUP.

In my work on *The American Race*,* I offered the following classification of this group:

TACANA LINGUISTIC STOCK.

Araonas,	*Isuiamas,*	*Pukapakaris,*	*Tumupasas,*
Atenes,	*Lecos,*	*Sapiboconas,*	*Tuyumiris*
Cavinas,	*Maracanis,*	*Tacanas,*	
Equaris,	*Maropas,*	*Toromonas,*	

From this list we must strike out the *Atenes* or *Atenianos* and *Lecos*, as I shall show that these spoke a tongue nowise akin to the

* *The American Race: A Linguistic Classification and Ethnographic Description of the Native Tribes of North and South America.* By Daniel G. Brinton. 1 vol., 8vo, pp. 392 (N. D. C. Hodges, New York, 1891).

Tacana, in spite of some assertions to the contrary by Spanish writers

Other tribes which should probably be added to this list, as they are located on old maps within Tacana territory and have Tacana names, are:

Carangues, on left bank of Rio Tarabeni

Chumanos, north of Lake Roguaguado

Poromonas, on the lower Rio Beni (or Poro)

Samachuanes, on Rio Coroico.

Uchupiamonas, on the Rio Uçhupiamona.

Yubamonas, on the Rio Yubá.

The termination *monas* to several of these names is the Spanish plural form of the Tac *manu*, river, the tribes being named from the streams along which they lived

In addition to the above I have found that the tribe known as "Guarizas" is to be included among the Tacanas. A series of texts in their language, comprising the Pater, the Ave and the Credo, was found among the papers of Cardinal Mezzofanti, and has been published by Prof. Emilio Teza in his *Saggi inediti di Lingue Americane* (Pisa, 1868). The learned editor states that all his endeavors to identify this language, or to ascertain the location or affinities of the tribe, had been fruitless A comparison of the Guariza Pater with that in the Tacana, both of which I give on a later page, will prove the very close relationship of the two tribes.

D'Orbigny asserts that "Tacana" is not the name of a tribe, but the name of the language. It is called by Spanish writers of the last century the "Maracani,"* which is apparently not the same as the *Macarani* of the mission of Santiago among the Chiquitos.

The earliest missionary explorer of the Rio Beni, Fray Francisco de Rosario, wrote a report in 1677, in which he mentions a number of tribes, now extinct, among them the Hucumanos and the Torococyes, whose names indicate them to have belonged to the Tacana stock.†

Location and Number.

The general location of the Tacana group may be described as along the eastern slope of the Cordillera, where it descends to the

* See D'Orbigny, *L'Homme Américain*, Vol. I, p 374; *Descrip. de las Misiones del Alto Peru* (1771).

† His report was printed in full in Melendez, *Tesoro Verdadero de las Indias*, Tomo III.

valley of the river Beni (otherwise called the Rio Poro, the Rio Pilcopata and the Rio Madre de Dios), and in the valley of the latter on both banks, between South lat 12° and 15°. At present the Tacana dialect proper is spoken in the towns of Tumupasa and Islamas, the Araona by the Araonas, who dwell on the banks of the Beni and on those of its western tributaries, known as the Manuripi, Tahuamanu and Uaicomanu; the Cavineño is confined to the mission of Cavinas; the Maropa to the Maropas, in and near the Pueblo de los Reyes, on the right bank of the Beni, about 12° 30′ S lat., while the Sapis or Sapibooonas appear to have been the most eastern branch of the stock, as they were attached to the mission of the Moxos in the province of that name on the Rio Mamore.

In 1831 the total number of persons speaking the dialects of this stock was about 6000 (D'Orbigny) The majority of these are nominally Christians and have fixed habitations, but the Toromonas, who dwell between the rivers Madidi and Beni, in 12°–13° South lat, are still uncivilized and heathens, so, also, are the Araonas, who are stated to be cannibals and idol worshipers Their idols are geometrically shaped pieces of polished wood and stone. Their chief deity is "Baba Buada," whom they identify with the wind, *mutana*, and whose home is in the air. He is said to live towards the south and to be the creator of heaven and earth. The general term for divinity is *edutzi*, and there is a *sia edutzi*, god of maize; an *agave edutzi*, god of health, etc. Each *edutzi* has his own *yanacona*, or priest, to superintend the proper rites.*

Loan Words.

The Tacana-speaking tribes have for generations adjoined on the west the once powerful and cultivated Aymaras, and on the north the populous herds of the Panos. The consequences on their tongue have been quite marked A number of words have been borrowed from both sources; but they are not so frequent nor of such a character as to authorize the supposition of an original unity with either of the stocks named I give a list of some of these.

Identities in Aymara and Tacana.

	Aymara.	Tacana
Arm,	*ampara*,	*embai*, M.
Body,	*amaya*,	*eamá*, M.

* E. Heath in *Kansas City Review*, April, 1883; Col. Labré in *Proc Roy Geog Soc.*, 1889; Nic. Armentia, *Explor. del Madre de Dios*.

	AYMARA	TACANA.
Boat,	*huampu,*	*enembá,* M.
Cold,	*t'aarata,*	*brusda,* T.
Earth (patria),	*marca,*	*mechi,* S.
Green,	*ahojna,*	*ahina,* T
Heaven,	*alakhpacha,*	*euaua pacha,* T.
House,	*utan,*	*etai,* M.
Island,	*huatta,*	*eda-pupu,* T.
Lightning,	*llipikh llipikh,*	*jili-jili,* M.
Man,	*ohacha,*	*dreja,* M.
Meat (flesh, body),	*aycha,*	*aicha,* T.
Morning (Span *mañana*),	*maylla,*	*maita,* M.
Night,	*aruma,*	*apume,* M
Old,	*achachi,*	*ari,* M
Star,	*huara,*	*arujdi,* T.

IDENTITIES IN PANO AND TACANA.

	PANO.	TACANA
Blood,	*imi,*	*ami.*
Child,	*abaque,*	*ebaeue.*
Flesh,	*nami,*	*yami.*
Hill,	*matsy,*	*emata.*
Moon,	*bari,*	*bari.*
Small,	*hata,*	*bata.*
Son,	*embaque,*	*gua embaque.*
Sun,	*uirti* (star),	*irati.*
Tongue,	*ana,*	*eana.*
Uncle,	*cucu,*	*cucu, jaju.*
Water,	*jena,*	*ena.*

The only two numerals which can be claimed for the Tacana evidently also belong to the Pano.

	TACANA.	PANO.
One,	*pea,*	*atchou-pi, pa-jà.*
Two,	*bata,*	*ta-ba, ru-bû.*

The important words for maize, salt, tobacco and banana seem to be borrowed from other tongues:

Maize, *shiji* or *diji*.—Probably the Pano *sshequi*, which in turn is undoubtedly the Kechua *sherchi*, roasted maize. The grain evidently became known to the Panos as an article of food in this prepared form.

Salt, *bana*.—Apparently a variation of the Arawak *pamu*.

Tobacco, *umasa* or *umarsi*.—Doubtless, from the Tupi *pui-uma*, Maypure *iema*.

Banana, *bendara* and *neja*.—The former is the Pano *banara*, *panala*, and *neja* is the same word with the first syllable omitted, *banara* is but a corruption of *banana*, an Arawak word.

The color names appear to me irreducible, except that for "green," which has been borrowed from the Aymara.

White,	*pasana.*
Black,	*desena.*
Blue,	*danana.*
Red,	*derena.*
Yellow,	*tidnia.*

A few similarities to the Mosetеño, a language spoken by a neighboring stock, may be noted:

	TACANA.	MOSETEÑO.
Fish,	*ase,*	*señ.*
Foot,	*euatri,*	*yú.*
God,	*edutsi,*	*dogñ.*
Water (river),	*ena,*	*ogñi.*
Woman,	*epuna,*	*phen.*

But these have little significance.

PHONETICS.

All the Tacanan dialects are facile and agreeable in their sounds, differing in this respect from the Aymara and Kechua, both of which are harsh to the European ear and almost unpronounceable to a foreigner. The Araona has no sound which is not capable of correct expression by the Spanish alphabet; but the Tacana has the strong English *th* (as in *this*); a soft, scarcely audible aspirate, and a sound intermediate between *t*, *d* and *r* (heard in *dudu*, brother, *tata*, father, etc.), while the soft Spanish *th* (as in Span. *ce*, *ci*) is absent. The *l* is not heard in any native Tacana word

The statement quoted by D'Orbigny, from a MS. of one of the missionaries, to the effect that the Tacana is one of the most guttural and harshest of languages, is quite incorrect and could not have been intended to apply to any of the dialects of this group

PRONOUNS.

The paradigms of the Tacana pronouns are as follows·

I,	*ema.*	We,	*ecuana.*
Of me *or* mine,	*quiema.*	Of us, our,	*ecuanasa.*
For me,	*quiemapuji.*	For us,	*ecuana puji.*

To me,	*ema.*	To us,	*ecuana.*
With me,	*ema neje*	With us,	*ecuana neje.*
Thou,	*miada.*	You,	*micuana.*
Thine,	*miquada.*	Your,	*micuanaaia.*
For thee,	*mique puji.*	For you,	*micuanapuji.*
To thee,	*mida.*	To you,	*micuana.*
With thee,	*mi neje*	With you,	*micuananeje.*
He or she,	*tueda*	That,	*iohu.*
Those,	*tueda cuana.*	Those,	*iohu cuana.*
His or her,	*tueeda.*	This one,	*jida.*
This,	*yhe.*	These ones,	*jida cuana.*
These,	*yhecuana.*	Who?	*aydani.*

Verbal Forms.

Of all the dialects the Tacana is richest in verbal forms, and its various subdialects are less variable than its neighbors.

Further, Armentia states that all the dialects have a dual number in both verbs and pronouns, but his work does not furnish the means of analyzing the character of this dual. As is well known to grammarians, there are several very different conceptions of duality in language.

The notion of action in the verbal theme undergoes modification by suffixes, thus:

ha, to make, to do.
e-hatani, I am doing ($e = ema = $ I)
e-hamatani, I am ordering it to be done
aqua, imperative, do ye.
atiqua, go thou and do.

Of such suffixes, *ja* expresses desire or to wish, as:

puti-ja, I wish to go.
dia-ja, I wish to eat.
idi-ja, I wish to drink.

The suffix *ji*, appended to a noun, signifies possession, as *chipile-ji*, one having money; but reduplicated and suffixed to a verb, it conveys the sense of past time, as:

puti-jiji, he has already gone.
dia-jiji, he has already eaten.

The termination *ti* appears to be that of the reflexive verb :

doma, to cover.
ja domati, to cover oneself.

The neuter is changed to the active signification by the suffix *me* ·

mani, to die.
manaimena, to kill.
ja manuameji, he who has killed another.

Many verbs are compounded by simple juxtaposition, as :

babe, to know ; *quisa*, to tell ; whence :
babequisa, to teach, *i. e.*, to tell what one knows.

The word *babe*, to know, is itself a derivative from *ba*, to see, which also appears in such compounds as *diaba* (from *dia*, to eat), to eat, seeing, *i. e.*, to test or try a food (*probar la comida*), and *batsuatique* (*tsuati* = above), to look upward

LITERATURE AND TEXTS.

The literature of the Tacanan dialects—if I may apply this term to such meagre material—is widely scattered and difficult of access. Ludewig, in his *Literature of American Aboriginal Languages* (p. 206), speaks of it as a dialect of the Yurucare, with which it has not the slightest affinity The same author gives the Sapibocona as a dialect of the Kechua (p 168), and the Maropa as related to the Yuracare.

Of the Tacana proper I have made use of three published vocabularies: 1 That given by H. A Weddell, *Voyage dans le Nord de la Bolivie* (Paris, 1859). He gives forty words and six numerals, obtained from a party of Tacanas from Ixiamas and Tumupasa, whom he met at Guanay. 2 A vocabulary of one hundred and fifty seven words and six numerals, by Dr. E. R. Heath, contributed by him to the *Kansas City Review*, April, 1883. 3. A vocabulary of forty-eight words and ten numerals, accompanied by grammatical observations by the Rev. Nicholas Armentia, published in his *Exploracion del Rio Madre de Dios* (La Paz, 1889).

The only printed text I have found is a small octavo of forty-one pages, with the following title :

" Catecismo | de la | Doctrina Christiana | en Idioma Tacana |

por un Misionero del Colejio de | Propaganda—fide de la | Paz de Ayacucho | 1859. | Imprenta de Vapor.—Calle de la Aduana, No. 36.

The text is entirely in Tacana, without the corresponding Spanish, and embraces the Pater, Credo, Salve, Smaller Catechism, Explanation of the Doctrine, the Via Sacra, etc. I have been unable to discover the author

Further, Armentia gives also vocabularies of the Araona and Cavineño dialects, and Dr Heath supplies one of the Maropa. For the Sapibocona, I have relied on that printed by Hervas in his *Vocabulario Poligloto* . ·

Dr. Heath refers to the great similarity between the Maropa and Tacana dialects, and adds the remark: "The Maropas have many words that have significations widely different, *etra* means bone and also hair, *biya* means a louse, a wasp and urine" Probably there is a difference in accent or inflection, which is not apparent to the European ear, but which to the native indicates which sense is intended.

The version of the Lord's Prayer given below, as well as that of the Creed, are taken from the *Catecismo en Idioma Tacana*, above referred to I have added an interlinear translation of the former, and also a translation of the latter, as there is evidently some slight change of the customary phraseology.

Lord's Prayer in Tacana.

Ecuanasa tata euacuapachasu, mi canichanepajiji papu mique ebani,
Our father heaven in, thou sacred come thy name,
mique euacuapacha ecuanasa papu, mique enime emi papu ye canasu,
thy heaven (to) us come, thy wish come earth on,
euacuapachasu epuani nime eiame Amen Jesus. Pamapa sinasu ecuanasa
heaven in come (like to?). Amen Jesus. Every day our
equita tuchaji jaase ecuanatiaque Ecuanasa jucha cuana chenubaque,
body food to us. Our sins forgive,
cuaja bata ecuaneda cichenubania ecuanasa manu cuana, ba ecuana
even as we forgive
dajajamaji mi juchasu, inasiguaque pamapa madada cuanasu. Amen
remove all evil us from.
Jesus.

Alongside of this I quote the same in the Guanza dialect, from Prof. Teza's work, already mentioned:

Lord's Prayer in Guariza.

Bahana tata evacuapachasu anigi mi, ibbubatagigicapapuini migo acani, echebe pasu papa eyucaini mi reyno, agigicapapuini migo anima eubbasu evacuapachasu bataja. Ecama genbe chinasu tiage echesa jana pugi; echebe jucha gigiouana iohanubage echesa jucha çeiahu, tuevata ecama echesa majayouana ichanubbasa ecama juchama age vaco par'ejaja juchasu, chutama jubua iohanume evanasu ecama mapanage

It is evident that this is a version by a different hand into a closely allied dialect.

Creed in Tacana

I believe in the Father God, of all things in heaven and on earth the maker; I believe in the Lord Jesus Christ, His only Son, who was conceived by the grace of the Holy Spirit, and was born of a virgin; he suffered under the power of Pilate; he was crucified, he died, he went down to limbo, from among the dead he arose on the third day, he went up to heaven; there he is seated on the right hand of the Father almighty; whence he shall come to judge the living and the dead, I believe in the Holy Spirit, the holy Catholic church, the communion of all the saints, the pardon of sins, and that our bodies shall rise again, and that life shall not end.

Eama jei eanla tata Dios pamapa aji, evacuapachasu ye eausu neguameji; jei eanla tata Jesucristo tusa evacua peada quita, bataji puida Espiritu Santasa gracia eje putau; etasea cuara Virgen cuinaida, ichenuda cuana vidinaida Pilatosa emesu; tatajiji puida cruasau, dapia manujiji puida, limbosu butaida, manujiji cuana dujusu neitianaida quimicha ainesu, aoatida evacuapacha, mesa tata pamapa aji bai eni bene caui, da jenettia epuelcha eidani cuana, manujiji cuana equimba puji, eama jei eania Espiritu Santosa, santa Yglesia catolicasu, santo cuanasa ayaaida jacti cuanasa jaditati, jucha cuanasa perdon, ecua nasa equita quita eydeyo pupebe mave eida caui.

Vocabulary—English-Tacana and Dialects.

T = Tacana (T W = Tacana of Weddell); M = Maropa, S = Sapibocona, A = Araona, C = Cavineño.

Orthography Spanish; *j* = Eng. *h*; *h* scarcely perceptible; *z* = Eng *th*,

Alive, *eirle'ja*, T.; *aschesene*, M.
All, *pamapa*, T, *huana'*, M.
Always, *deja-pincha*, T.
Arm, *ebu'a*, T; *embui*, M (probably from *ema*, hand)
Arrow, *pisa*, T; *pisi*, M.
Ascend, to, *tauati*, T.
Ashes, *etimu*, T, A.; *etiquimuru*, C
Aunt, *naua*, T., A., C
Bad, *mada'da*, T, *emaae'*, M (= *ma-saida*, not good)
Bark (of tree), *eviti*, T; *embiti*, M.
Beard, *que'da*, T; *eñese'*, M.
Belly, *ete*, T; *eae'*, M., *edda*, T (W.)

Bird, *dia*, T.; *bu'na*, M.
Black, *devena*, T; *sehe'mi*, M.
Blood, *ami*, T and M.
Blue, *danane*, T., *savume'*, M.
Body, *equita*, T, C., *ea'mi*, M.; *etuicha*, A.
Bone, *e'tro*, T., *etra'*, M.
Bow, a, *pisatri*, T.; *pisatrua*, M. (see *Arrow*)
Boy, *canana*, *edsava*, T, *dreja'ue*, M. (see *Man*), *toro*, A., *ebacuapi*, C (see *Child*, *ve* is the diminutive suffix).
Breasts (= mammæ), *etru*, T and M.
Brother (my elder), *quema-onici*, T; *be'tri*, M.
Brother (my younger), *quana-cou'*, T., *chutri*, M.
Brother, *sau*, *uitsacua*, A., *jau*, *sui*, C.
Canoe, *cua'bua*, T, *cuamba'*, M, A; *cuaba*, C. (Aymara).
Charcoal, *etida*, T, *etesi*, A.; *etirutsene*, C.
Chest, the, *etredu*, T, *cohentru*, M. (breast bone? see *Bone*)
Child, *ebacua*, T.
Cold, *bruada*, T, *sinna'ma*, M.
Come, to, *pua*, T; *apueya*, M; *papu*, T.
Cry, to, *tsia-tsia*, T, *jajaja*, M. (imitative)
Dance, to, *tiri-tiri*, T and M. (imitative)
Daughter, my (by father and mother), *embaquapuna*, T; *qui embaqua*, M; *ebacuepuna*, A., C. (see *Child* and *Woman*)
Day, *tru'ne*, T and M, *chine*, S.
Dead, *manujiji*, T. and M.
Deer, *ba'que*, T; *batru'nu*, M.
Die, to, *manu*, T.
Dog, *vehi*, T.; *pacu*, M.
Drink, a, *ayeidi*, T, *eidi*, A., *eigi*, C.
Drink, to, *idi*, *eidi*, T, *jaisohitri*, M.
Duck, a, *se'a*, T; *su'ei*, M.
Ear, *edaja*, T; *sahacue'na*, M.
Earth (land), *medi*, *edua*, T; *metri*, M., *mechi*, C, S., *eua*, *meei*, A.
Eat, to, *dia-dia*, T.; *chancha*, M.
Egg, *e'ja*, T. and M.
Evening, *trinati'a*, T., *trinequa*, M. (see *Day*)
Eye, *etradru'adru*, T, *siachundru*, M.; *siuachàru*, S. (see *Sister*, *Elder* and *Hair*; apparently "sister hairs," *i. e.*, eyebrows, eyelashes).
Face, *embu*, T and M.
Father, my (by son), *rema-tata*, T.; *qui-tata*, M., *tata*, or *chacua*, S. C.
Father, my (by daughter), *rema-tata*, T, *qui-tata*, M.
Far, *equeda*, T, *kuasumi*, M.
Feathers, *eina*, T, *enuqua*, M (compare *Hair*)
Fingers, *ema*, T, *emachuja*, M. (= head of hand)
Fire, *qua'ti*, T; *cua'ti*, M, S, A., *etiqui*, C, *oire*, T (W) (compare *Ashes* and *Wood*)
Fish, *eisi*, M., *sse*, T., *ja*, A.
Flesh (see *Meat*, *Body*)
Fly, a, *vere-vere*, T; *bebi*, M. (imitative).
Food, *jana*, T, A.; *eiduca*, C.
Foot, *equatri*, T, *ecatri*, M, *ebbachi*, S., *euatsi*, A, C.
Forehead, *emaki*, T.; *emma'ta*, M. and S.
Forest, *eu'ja*, T., *hayjiatru*, M.
Friend, *apare'ja*, T, *epere'ja*, M.
Girl, *putu*, *epunane*, T, *punane*, M; *ebanacua*, A; *ebacuna*, C (*ve* = diminutive, see *Child*, *Daughter* and *Woman*).
Give, to, *tia*, T., *tia'ne*, M.
Go, to, *pu'ti*, T. and M; *puj*, A., *cua*, C.
God, *erushi*, S, *edutsi*, T, A.; *edushi*, C.

Good, *saida*, *saipiane*, T.; *fundra*, M.
Grass, *nuisa*, T., *sa'ji*, M
Great, *aida*, T., *hayuni*, M.
Green, *okina*, T., *ur'hopiki*, M.
Hair, *tchu-ana*, T ; *stra*, M , *schau*, S. (see *Head*, *Feather*, *Wing*).
Hand, *e'ma*, T ; *ema*, M , S., A , *ema-tucu*, C.
He (pron), *tu eda*, T , *tu-sa*, M.
Head, *schu*, T , *urkuja*, M. and S , *sahua*, A , *iguca*, C.
Heart, *manu'ma*, T ; *masumu'*, M , *emafoba*, A , *enifu*, C
Heaven, *evacuepana*, S.; *evacuapacha*, T ; *buspo*, T (W)
Here, *upi'oa*, T , *tasu'*, M.
Hill, a (or mountain), *anata*, T , *amina*, M (probably from *ema*, extremity, point, hand)
Hot, *sina'da*, T , *sintri-trima*, M.
House, *ejtej*, T.; *etai*, M., A.; *etare*, C
Husband, my, *quemayaai*, T., *qui ana*, M.
I (pron), *ema* (active form, *sa'ma*), T.; *e'ma*, M
Ice, *sa'na*, T.
Infant, *sanane-chichi*, T. (see *Boy*), *ejanana*, M.
Iron, *psama'*, M.
Island, *sdapu'pu*, T , *isaka'pupu*, M
Jar (Sp. *olla*), *juin*, T , A , *emaricaca*, C.
Kettle, *co'to*, T
Kill, to, *manuama*, *amanuani*, T , *mana'ma*, M.
Knife, *cuchilo*, M (Spanish)
Know, to, *baba*, T
Lake, *bai*, T. and M , *eubikura*, S. (see *Water*).
Laugh, to, *ydeba'ti*, T.; *yaschi-bati*, M.
Leaf, a, *equana'*, M.
Learn, *baba taua*, T
Leg, *ekida'da*, T.; *eta'*, M , *etia*, T. (W).
Lie, to, *bidumini*, T ; *sa'na*, M
Lightning, *tsaru-tsaru*, T ; *jili-jili*, M , *ilapa*, S
Love, to, *eabune'ba*, T.; *imbunimbu*, M.
Maize, *dija*, T.; *shije*, M , *sia*, A.
Make, to (Sp *hacer*), *ha*, T.
Man, *de'ja*, T , C., *dreja*, M ; *reanci*, S.; *deja*, *eoulaha*, A
Many, *yucua'da*, T , *dru'je*, M.
Meat, *aicha*, T., *sa'mi*, M , *yami*, A., *erami*, C
Money, *chipilo*, T
Moon, *ba'di*, T , A., C., *lantri'*, M , *bari*, S.
Morning, *matnahu*, T ; *mai'ta*, M
Mother, my (by son or daughter), *quema-qua'ra*, T ; *quiona*, M , *cua*, S ; *uaua-di*, A , *cuaha'*, C
Mouth, *aquatra*, T , *equa'tra*, M , *ebbo*, T (W)
Musquito, *sani* or *di*, T , *dri*, M.
My, *quema*, T., *qui*, M
Name, *ebani*, T , *embani*, M
Nails, *ema-tichi*, T , *ema tichi*, M (see *Hand*)
Near, *narise*, T., *drema'*, M.
Neck, *eti'pi*, T and M and S.
Never, *niquisisunu*.
Night, *lisa*, T , *apuma'*, M.
No, *ma'aa*, T and M.
Nose, *eui-eni*, T , *eui*, M and S
Old, *eati*, T , *e'ai*, M.
Our, *ecuanana*, T.
People, *endrana*, T , *driani qua'na*, M
Plantain (Sp. *platano*), *nasa*, T , *naja*, A ; *bendare*, C
Prairie, *nuisa'ni*, T
Rain, *nai*, T and M
Rattlesnake, *bacua dada*, T., *cum bacua*, M (see *Snake*)
Red, *derana*, T , *utruma*, M
River, *ena*, T., *manu*, A., *eneperanrida*, C. (*ena* = water).
Rivulet, *enabaqua*, T. (= child-water).

Road, *edili*, T ; *edini*, A. ; *edigi*, O.
Run, to, *judu'du*, T. ; *saadrundu*, M.
Salt, *banu*, T. ; *bano*, M.
Say, to, *quisa*, T
See, to, *ba*, T ; *jam bati*, M.
Silver, *depe*, T., *sepe*, A.
Sing, to, *saisu*, T ; *satru*, M
Sister, *satna*, A., *taina*, T ; *nasi*, *jane*, O.
Sister, my older, *quema du'du*, T, *drundru*, M.
Sister, my younger, *quematona*, T., *la'na*, M (In M eldest brother says *cani* to his youngest sister)
Sit, to, *anu'ti*, T ; *animbotia*, M
Skin, *ebbai*, T (W)
Sky, *bueyu'pa*, T, *embaguaparha'*, M
Sleep, to, *tabi*, T. and M
Small, *chicli*, T., *batavi'chi*, M.
Snake, *bacua*, T and M
Son, my (by father or mother), *quema-embami*, T, *qua-embaquu*, M, *ena*, A, *ebacua*, T C (see *Child*, *Daughter*)
Soul, *enidu*, T, *ejiay*, A., *yolacuana*, O
Speak, to *mimi*, T and M
Squash, a, *je'au*, T, *je'mi*, M.
Stand, to, *enuidnajenetai*, T., *ne'ti*, M.
Star, *eru'jai* or *etubay*, T, *buana'ei*, M., *etujay*, A, *purari*, C
Steal, to, *tsi*, T., *tri*, M.
Stone, *tumu*, T, C, A. and S ; *tuma*, M.
Strong, *tucho'da*, T, *tretremi*, M.
Sun, *ire'ti* or *ideti*, T, *iajeti*, M., *igeti*, C
Teach, to, *babe-quisa*, T
Teeth, *etre*, T. and M, *iche'*, T. (W) (compare *Bone*)
That, *ychu*, T, *ichu*, M
There, *chupia*, *dapiavi*, T., *ichueu*, M.
They, *ychu cuana*, T, *tuna'ce*, M.
Think, to, *piba*, T, A. ; *edeba*, O.
This, *yke*, T, *ique*, M.
Thorn, *equida*, T ; *acuise*, A. ; *acuija*, O.
Thou, *mi-cla*, T. ; *mi-ca*, M.
Thumb, *ema-chuai*, T, *eme-chuja*, M. (see *Hand*, *Fingers*, *Head*).
Thunder, *etiria'ni*, T. ; *ti'ri*, M.
Tobacco, *umar'si*, T ; *umasa*, M.
To-day, *jeona*, T. and M.
To-morrow, *matia-pācha*, T, *bantra*, M. (see *Yesterday*).
Toes, *equatri ritrana*, T ; *eaatritichi*, M. (see *Foot* and *Nails*).
Tongue, *sana*, T, M and S
Tortoise, *dati*, T, *dra'ti*, M
Town, *eju'de*, T, *ejuntre'*, M., *erere*, A, *epu*, O (see *House*).
Tree, *a'qui*, T. and M, *acui*, A, O.
Uncle, *juju*, T, A., *cuou*, O. (a celebrated word, probably of Carib origin, on which Martius founded his classification of the "Guck" nations).
Walk, to, *arease'*, T, *ase*, M.
Warrior, *jamaji tipuji* (a quarrelsome person), M.
Water, *casi*, T, *yu'ei*, M, *euei*, S, A, *ene*, C ; *ya'ni*, T (W)
We, *ecuana* (dual form, *etase*) T, *ecoma'*, M.
When, *quisiacuu*, T
White, *pasana*, T., *pasa'me*, M.
Who, *ayde'ni*, T ; *hayae*, M.
Wife, *quema-equani*, T, *quienana*, M.
Wind, *be'ni*, T and M (from this comes the name of the Rio Beni = Wind river)
Wing, *enabay*, T, *eunambai*, M. (see *Feathers*)
Wish, to, (Span. *querer*), *tsada*, T
Woman, *epuna*, *a'ne*, T ; *a'nu*, M. and S. ; *epuna*, O, A
Wood, *e'na*, T ; *a'qui* (= tree), M., *cuati-manu*, A ; *cuati*, C. (see *Fire*).

Work, to, *muduamudu*, T.; *mundru*, M.

Ye or you, *micuana*, T., *mica'ee*, M.

Year, *mara*, S.

Yellow, *tidnia*, T., *sahuami'*, M.

Yes, *aha*, T.; *ee*, M.

Yesterday, *maila pücha*, T., *maila*, M (see *To-morrow*)

Young, *edea-ee*, T.; *dreja-vese*, M. (= young man)

Numerals.

1, *pea*, *peada*, *peara*, T., *pembiae*, M.; *pebi*, S., *equena*, Cat.
2, *beta*, T., M. and S.
3, *quimicha*, T., *camischa*, M. (Aymara)
4, *pusi*, T and M. (Aymara)
5, *pichica*, T and M. (Aymara)
6, *sucuta*, T. and M. (Aymara)
7, *siete*, T (Spanish)
8, *ocho* (Spanish).
9, *nueve* (Spanish).
10, *tunca*, M (Aymara), *peara tunca*, T
20, *beta tunca*, M (Aymara)

Tacana-English Vocabulary.

Aicha, meat, flesh
Aida, great.
Ami, blood
Anuti, to sit.
A'no, woman, wife.
Apareja, friend.
Aquatri, mouth.
Aqui, tree.
Aquida, thorn.
Arease, to walk
Atra, mammæ.
Aydeni, who.
Ba, to see.
Babe, to know
Babe quisa, to teach
Babe-isua, to learn.
Bacua, snake.
Bacua-dada, rattlesnake.
Badi, moon.
Bai, lake.
Banu, salt.
Baque, a deer
Bani, wind.
Beta, two.
Brueda, cold.
Bueyupa, sky
Dadu, sister (elder).
Canane, a boy
Cani, sister (by brother).
Chichi, small.
China, green.
Chipilo, money
Chupia, there.
Ceni, younger brother.
Coto, kettle
Cuabua, canoe.
Cuati, fire
Deja-puecha, always
Danane, blue.
Depaue, there.
Dati, tortoise.
Deja, man
Depe, silver.
Derena, red.
Decena, black
Dia, bird.
Dia-dia, to eat
Dije, maize.
Eana, tongue.
Ea'na, ice.

Eavi, water
Ebani, name
Ebbei, skin
Ebue, arm.
Echu, head
Echuena, hair
Eclі, old
Ecuana, we.
Ecuanasa, our
Edeane, young
Edidi, road, path
Edaja, the ear.
Edapupu, island
Edeane, a boy
Edua, earth, land
Ehe, yes.
Eisleja, alive.
Ei'na, wood
Eina, feathers
Eja, an egg
Ejiji, forest.
Ejtrj, house
Ejude, town
Ema, or *eama*, I
E'ma, hand, fingers
E'ma chuen, thumb
Emali, forehead
Emata, hill
E'ma-tichi, nails
Embami, son
Embu, the face
Ena, river
Enabay, wing.
Enidu, soul
Epuna, woman, wife
Equani, wife.
Equatri, foot.
Equatri-ritrana, toes
Equita, body.
Eruchi, god.
Erujai, star
Eshuneba, to love
Etidada, the leg.
Etide, charcoal
Etimu, ashes.
Etipi, neck.
Etiriani, thunder.
Etra driandru, the eye.
Etre, tooth.
Etredu, the chest
Etro, bone.
Etu, belly
Etubay, star
Evacuepacha, heaven
Eviani, nose.
Evisi, bark of a tree.
Ha, to do, to make.
Idi, to drink
Ireti, sun
Jana, food.
Jeave, to day.
Jenu, squash.
Judu'du, to run
Juju, uncle
Jutu, jar.
Lisa, night
Madada, bad
Maeta puicha, to-morrow or yesterday
Manu, to die.
Manuame, to kill.
Manujiji, dead
Masumo, heart.
Mataehu, morning.
Mase, no.
Medi, earth, land
Miela, thou.
Micuana, you.
Mimi, to speak
Mudu mudu, to work.
Nai, rain.
Narise, near
Nasa, plantain.
Nena, aunt.
Niquisteuna, never.
Nuisa, grass.
Nutaani, prairie.
Onibaquapuna, daughter
Onisi, elder brother
Pamapa, all.
Pea, one.
Peama, iron

Piha, to think.
Pichica, five.
Pisa, arrow.
Pisatri, a bow
Pus, to come.
Pusi, four
Puti, to go.
Putu, girl.
Quara, mother.
Queda, board
Quema, my.
Quitatumu, when
Quimicha, three.
Quisa, to say, to tell
Saipiana, good
Sani, musquito.
Saturu, to sing.
Se'e, a duck
Sinada, hot.
Siri, fish
Sucuta, six
Tabi, to sleep.
Tata, father
Tia, to give.
Tidiuta, yellow.
Tiri-tiri, to dance
Tona, sister (younger)
Trina, day
Trinetia, evening
Tsada, to wish.
Tsoru tsoru, lightning
Tsi, to steal
Tsia-tsia, to cry.
Tsuati, to ascend
Tuchada, strong.
Tu-eda, he.
Tumu, a stone or rock
Uchi, a dog.
Uilacua, brother
Umarsi, tobacco.
Upica, here
Uqueda, far
Vere-vere, a fly
Yavi, husband.
Yohu, that.
Yehuevana, those, they
Ydebati, to laugh
Yhe, this.
Yuevada, many
Zaina, sister
Zau, brother

II

THE JIVARO LANGUAGE

The material which I have to present on this language is entirely from unpublished sources, and is the more valuable as, so far as I know, not even a vocabulary of this important idiom has ever been printed.

The Jivaros (Givaros, Xivaros, Hibaros, Xeberos, etc.) are a numerous and powerful nation, mostly yet in a savage state, who dwell about the head waters of the rivers Paute, Morona, Santiago and other upper affluents of the Marañon, between 2° and 4° 30′ South latitude, where they occupy the eastern slope of the Cordilleras. I have described their general culture and history in my work on *The American Race*, pp 282–284.

They are said to present the peculiarity of unusual lightness in color, and features of a decidedly Aryan type.* These traits have

* "Aujour d'hui le type caucasique y domine," says Father Joseph M. Magalli, in *L'Année Dominicaine*, Paris, 1889.

been usually explained by a supposed extensive infusion of Spanish blood when their ancestors captured the city of Logroño in 1599 and carried off the white women as wives. More probably they share, with the Yurucares, Tacanas and other Andean nations, the peculiarity of a complexion several shades lighter than that of the Kechuas and Aymaras.

They have been little influenced by European visitors. A recent authority states that there are scarcely a hundred and fifty Christian families in the whole of the immense province of Canolos, a part of which they inhabit, and the area of which is more than 8000 square leagues.*

The sources which I have had at command are two MSS in the British Museum, the name of the author not given, but from some remarks probably a German Jesuit, who was a missionary to the tribe towards the close of the last century.

The titles are.

"*Vocabulario en la Lengua Castellana, la del Ynga, y Xebera*" Small 8vo, fol 35 The vocabulary embraces about 1300 words, and is apparently complete

"*Gramatica de la Lengua Xebera*" Same size This MS is imperfect, leaves being lacking both at the beginning and the end

From these MSS. I have prepared the following sketch of this tongue.

Phonetics

The sounds of the language are described as difficult to a European and fluctuating in character The indistinct and alternating nature of certain phonetic elements appears in the Jivaro as in so many American tongues.

In vowel sounds, the *o* is often confounded with the *u*, the *e* with the *i*, and the *e* with the *æ*, which is like the German *ö* The complex vowel sound represented by *ëu*, as in *pëung*, fire, is especially difficult for a foreigner. The vowels *a* and *o*, when followed by *i*, are often elided.

The consonants *d*, *l*, *r* and *h* are frequently alternated (that is, the one sound may be used at will for the other), or an indistinct sound is uttered, which may approach any one of them. The *n* is

* So says Father Magalli, above quoted, but the knowledge of this writer falls far short of what is requisite when he adds of the Jivaros and Japaros, "Ils parlent tous la même langue, le Quichua" (?)

frequently omitted or uttered so slightly as to be scarcely audible. In the syllables *quec* and *qued* the final consonants are rarely clear, and both often have the sound *q'r*. In the vocabulary the *b* and *sch* should be pronounced as in German

Nouns.

The relations of nouns are indicated by suffixes, *e.g.*:

Tana, the forest.
Tananquec, to the forest, or, in the forest.
Tananola, from the forest.

Some words indicate the genitive relation by the termination *qui*.

Nouns may be formed from verbals by the suffix *ni* or *bi*, as *timinlec*, I die, *timipi*, the dead person, the corpse, also by the suffix *asu*, as *dacolalec*, I am ashamed; *dacolasu*, one who is ashamed The infix *cuda* has the same effect

The instrumental sense is conveyed by the termination *c*, which is the abbreviation of *quec* or *quecla*.

Seotia, knife.
Seotio quec, with a knife.

"With," in the sense of accompaniment, is expressed by *lec*, as:

Sadanulec, with a married man.
Poparulec, with my father.

Direction from is indicated by the termination *quecla*, "for" or "instead of" by *maleg*, as:

Naiquimaleg, for or in place of another

Pronouns.

The personal pronouns are.

I, *ooe*, *güa*.	We, *cuda*, *quiñmos*, *mapoa*.
Thou, *quenma*.	You, *quiñma'ma*
He or she, *nana*.	They, *nauba*, *nanaloca*, *nanadap'r-loca*.
This one, *ana*.	Those, *anudap'rloca*.

The possessives are:

Mine, *guaqui*, *ru*, *oa*.	Our, *cudaqui*, *mapoa*.
Thine, *quenmaqui*, *palia*, *ma*.	Your, *quenmamaqui*, *palenma*.
His, *nanaqui*.	Their, *nanaqui*.

The second forms above given are suffixes or infixes, as:

Sudaru, my husband.
Sudapalin, thy husband.
Loantaoasu, my desire.
Loantamasu, thy desire.
Loantasu, his desire.

As usual in American languages, there is no relative pronoun, its place being supplied by participial constructions.

NUMBER AND GENDER

Names of inanimate objects usually undergo no change in the plural. For persons the plural is formed by adding the suffix *lesa* or *nanlesa*. In possessives the plural suffix is often *na*, as:

Hucha, a sin.
Huchaneng, his sin.
Huchanengna, his sins.

Saden, his wife.
Sadena, his wives.

In verbals and verbs the plural termination may be *dde*, as:

Huchapidea, sinnings.

Anulao, leave me.
Anulaodde, leave us.

Infixes may be employed in place of these suffixes, especially in nouns derived from adjectives and participles. The most usual of these is *a*, as:

Nambilea, I live.
Nambesen, he who lives, the living man.
Nambiacasu, those who live, the living.

The syllable *ma*, used either as infix or suffix, also conveys the plural sense, as:

Palen, thine.
Palenma, your.

Feminines are distinguished by the suffix *la* or *lla*, as *vala*, boy; *valala*, girl; *lus*, man; *lusla*, woman. Also apparently by a change of another vowel to the *u*, as we find, *sadalec*, married man; *sudalec*, married woman.

Numerals.

The ancient cardinal and ordinal numbers of the Jivaros were as follows:

1, *ala.*
2, *catu.*
3, *cala.*
4, *encatu.*
5, *alacotegladu* (*ala*, one; *iegla*, hand; *du*, termination)
6, *intimutu* (the thumb, of the second hand)
7, *tannituna* (the index finger, of the second hand)
8, *tannituna cabiasu* (= the finger next the index).
9, *bitin tegla cabiasu.*
10, *catogladu* (= two hands)

This cumbrous plan has long been superseded by the adoption from the Kechua of the names of numbers above five, so that the present numeration is

1,	*ala.*	5,	*alacotegladu*	9,	*iskon*
2,	*catu*	6,	*soktu.*	10,	*chunka*
3,	*cala.*	7,	*ganchu.*	100,	*pacai*
4,	*encatu.*	8,	*pusac*		

Particles

A marked feature of this tongue, which it shares with so many others on the American Continent, is the abounding use of particles to modify the meaning of roots and themes. Whether these are to be regarded as themselves the remnants of worn-down themes, or as primitive phonetic elements, is a yet unsettled question, though for myself I incline to the latter opinion. The MS I am quoting gives a long list of such significant particles, the most important of which are as follows.

a or *ka* indicates causative action on another, as *uranlec*, I eat; *auranlec*, I cause another to eat.
apa or *pa* denotes present action, as *nambilec*, I live, *namblapalec*, I am now living.
nta or *ande* is a suffix denoting an interrogation.
cun, as an infix, denotes action about to take place
tala, as an infix, signifies that the action is of a permanent character.
imbo, as an infix, conveys a negative sense, and is often employed with the regular negative, *cola*.

itu, inserted before the termination of verbs, indicates that the action is done for another.

la, infixed, signifies that the action is for this one time only

mitan, infixed, conveys the sense that the action is shared by all present.

na, as a suffix, indicates habit, as *intulina*, he who is habitually in a bad temper.

nunda, infixed in the present tense, denotes that the action takes place at some other time; as *notonundales*, I do it (am accustomed to do it, but am not doing it now).

pa or *mba*, an affirmatory suffix.

qui, as an infix, denotes that the action takes place where the speaker is at the time.

ti is a frequent euphonic suffix, which does not alter the meaning

van, as suffix or infix, denotes possession, as *kuchovanleca*, those who have sins.

vanan, like *itu*, signifies action for another, as *muchovananamacu*, thou who asks for us.

ya or *nara*, as a prefix, intimates a wish or desire; as *paleo*, I see, *yapaleo*, I wish to see

ya, as a prefix, denotes reciprocal or mutual action, as *yaiamali*, they desire to take each other (in marriage)

Verbs

The verbs have but two tenses, the present and the future. Occasionally the adverb *epa*, now, is prefixed to define the present, and *naca*, pl. *naupa*, to denote a past time

The formation of the future is frequently irregular, but the following examples will show its usual forms. It alone appears to present a dual number.

	Present Singular.	Future Singular.	Future Dual.	Future Plural.
I do,	*notoleo*,	*notatic*,	*notoa*,	*notoaua*.
I take,	*maleo*,	*matic*,	*maa*,	*mauua*.
I love,	*tandeñleo*,	*tandeñatic*,	*tandeña*,	*tandeñaua*.
I speak,	*laonleo*,	*laontic*,	*laena*,	*laenaua*.
I die,	*timdaleo*,	*timentic*,	*timiantala*,	*timiantalua*.
I pray,	*maloaleo*,	*maloatic*,	*maloaa*,	*maloaua*.

The imperative is formed by the termination *qued*, often abbreviated to *q'r*, as *tecaleo*, I run, *tecaqued*, run thou Other terminations of an imperative character are *tan*, *aner*, *licaa* and *ma*.

The substantive verb is not found in the language, its place being supplied by terminations, especially the pronouns *cu* or *mecu*, etc., as *Pedrocu*, I am Pedro, *Pedroquemma*, thou art Pedro; *moim-*

hamaw, I am bad. In a similar sense the verb *naloc* or *nalec*, I do thus, I am thus, is often heard.

There is no trace of a true passive voice, its place being supplied by the sense of the verb or by particles.

At the conclusion of his MS the author inserts two versions of the Lord's Prayer—the one "in the Xebera language, as it was spoken in the earliest times of the mission," the translation being that of Father Lucas de la Cueva (about 1655), the second in the language of the period of the writer, which I suppose to have been about one hundred and fifty years later.

Of the second or later of these I have ventured an interlinear translation, while the former I insert without a rendering.

Lord's Prayer in Jivaro—Later Version

Papa mapoa, mosninanloques napala; linlinpalin nomisunsu muchai,
Father our, heaven in art thou, name thy holy become.
quenmaquinloesamasu cudaques unadiai, loantamasu nomisansu notoi
thy kingdom us to come, desire thy holy be
maponsu mosninanloquer, nanaposu pilaasu lupnquro unda, uglilosa
as heaven in, earth in, daily
landamapoa epala ugli encaodeo, cudaqui huchabidoo anuladuc, maponsu
bread our now to-day give, our sins forgive, as
quenmoa unda alapila dapa'dlotaqui huchanengna anulalidoo, anerata
we others their sins forgive,
quenmoa dentatutan, quenmoa cola Dios aguaimbocaqueo, nanamengtu
our our us
moimbosuouegla atiegodao.
evil from deliver

Lord's Prayer in Jivaro—Earlier Version.

Papa mapoa, mosnnques napaloo linlinpalin ruchapalun; quenma quilo-samasu cudaqueo unduai. Loantaoasu notetiuma mapolina mosninanloques inesupila anuminconloqueo unda Uglilosa tanda epala ugli encaodeo n[illegible]*oc cutuqui hudabidoo; dengquina cuda anulalidoo avbaqui huchanengna, anerata epolala muchaqueo amengdana; moimbocasuquegla atiego*

English-Jivaro Vocabulary.

Above, *mesenques.*
Ankle, *tula.*
Arm, *da'mpa.*
Arrow, *na'mu.*
Ashamed, to be, *dacotaleo.*
Ask, to, *mucha.*
Bad, *mohimbosu, aperosu.*
Beard, *amuuidola notari.*
Belly, *du', mapi, oqutuleo.*
Below, *silenquea.*

Bird, *ilans'r, tiperlia.*
Black, *catli, cadladasu*
Blind, *dapina.*
Blood, *uogladeo.*
Blue, *carcaso*
Body, *loqueglo, timepi.*
Bone, *lansi.*
Born, to be, *coldleo.*
Boy, *vila.*
Branch, *taũmao.*
Brave, *nan'lopi.*
Breast, *mutin, tilel.*
Brother, *yalli, yuyu'uo.*
Burn, to, *ãgedalec*
Buy, to, *ucelateleo.*
Calabash, *pabi.*
Call, to, *pooloico.*
Child, *cabi.*
Clothing, *capi.*
Come, to, *undialeo.*
Cold *no'qhed, noq'r.*
Cotton, *piteriu, boũngpalo.*
Cover, to, *palantuleo.*
Dance, to, *dansaleo*
Dawn, to, *ãgliti.*
Day, *'ugli*
Dead, *timianse*
Dear, *llada, nũnilu*
Death, *tominacase*
Deer, *boro'*
Dog, *nini.*
Drink, a, *huasu, ũleo*
Drink, to, *upallacu*
Drum, *tunde*
Dwell, to, *nambileo.*
Ears, *bũse.*
Earth, land, *lu'pa*
Eat, to, *caleo, uranleo.*
Egg, *cado*
Elbow, *quog'da*
Enemy, *quegma*
Enter, to, *da'leo.*
Eyes, *llada, da'pila.*
Face, *llada* (see *Eyes*)
Feather, *ambo'lu.*
Female, *cuapr*=
Field, *tiq'n llaua.*
Finish, to, *tasantuleo.*
Fire, *poung*
Fish, *samor, lapisamed.*
Flesh, meat, *canan.*
Flint, *mased.*
Flute, *pi'lealla.*
Flower, a, *danou.*
Food, *ca'lo'*
Foot, *la'ndeo.*
Forehead, *teqũeda'*
Forest, *tuna.*
Girl, *ellalu.*
Give, to, *n'galeo.*
Go, to, *paleo.*
Gold, *uri.*
Good, *mõa, moali.*
Grandfather, *papaiangu.*
Grandmother, *ami'*
Great, *cuni, chi, halupi.*
Green, *canis'rtia.*
Grow, to, *susuleo*
Hair, *hintio.*
Hammock, *ca'la*
Hand, *otegla.*
Have, to, *nali, napali*
Head, *uma.*
Hear, to, *lu'ocleo*
Heart, *cangan.*
Heaven, *moeninanlo*
Herb, *puma, daubad.*
High, *chi.*
Hill, *mulopi.*
House, *pi'dea.*
How? *mapeli.*
Hot, *ucasu.*
If, *aa, n'tati.*
In, *pa'leo*
Indian, *muda, cuapr*=
Iron, *huana'.*
Kill, to, *atimnialeo.*
Knee, *toto'pi.*
Knife, *sectio*
Know, to (things), *nintiiuleo.*
(persons), *loatuleo.*
Lake, *sangna.*

Last, *na'pi.*
Learn, to, *nintitenaler.*
Life, *nambiarasu.*
Light, a, *ugli, ooli.*
Light a fire, to, *atenginles*
Lightning, *yūmerles*
Lip, *ū'lec.*
Live, to, *nambiles*
Lizard, *tuda, lili.*
Love, to, *tan'deñles.*
Maize, *tōtra, toirlla*
Man (vir), *queñmopinoñ*
Married man, *sudales.*
Married woman, *sudales*
Medicine man, wizard, *piohetaru muda.*
Monkey, *duda, isolo, lolo*
Moon, *ducat*
More, *hapia.*
Most, *hakupi, mennts*
Mother, *auauc*
Mouth, *tala'.*
Much, *oapi, bape.*
Name, *lialia* or *lintia.*
Navel, *mumu'la*
Near, *pa'ula.*
New, *na'lu.*
Night, *degpili.*
No, *eola.*
Nose, *na'tio.*
Now, *opala.*
Old, *tas'serpi.*
Old (man), *tas'pitosu*
Old (woman), *tas'serllu.*
Open, to, *hoquirles.*
People, *oapesauda.*
Pray, to, *malealec*
Raft, *ecdu'.*
Rain, to, *ōla*ⁿ*, olanls.*
Rainbow, *podo'na.*
Red, *pip'rasu, togua*
Road, *degaun.*
Root, *ētarnia.*
Run, to, *tscales*
Salt, *leaeu'la.*
Say, to, *tules.*
See, to, *lōles, lkapeles*
Semen, *miladōo.*
Send, to, *piugles.*
Shade, shadow, *dachu'na*
Sierra, *obituna*
Sin, a, *hucha.*
Sing, to, *peclales.*
Silver, *culiqued.*
Sister, *chayauo, cadeous*
Sleep, *bililes*
Small, *hamecha*
Smoke, *cadlo* or *callo.*
Snake, *daua*
Soul, *vada, timipi.*
Spaniard, *endan.*
Speak, to, *laonles, lalales.*
Star, *tandola*
Stick, *na'la, unguña*
Strong, *nantupi*
Sun, *quo'qui.*
Sweet, *yali*
Take, to, *males.*
Tame, *dalals.*
Tapir, *pahuala*
Teach, to, *anintitaler*
Throat, *unqued*
Thumb, *intimutu*
To, *quec.*
Tobacco, *pintarlo, uhuales*
Tongue, *ninegla*
Tooth, *la'tec.*
Totem, clan, *patua.*
Town, *ninan'lo*
Tree, *nala, squig'uents*
Turtle, *mado.*
Uncle, *aprcha.*
Valley, *en'ca*ⁿ*.*
Virgin, *inlad.*
Wall, *lupa, patenpi.*
Water, *doc*
White, *dadapua'su*
Who, *deng.*
Wind, *tanlo'n.*
Within, *quo'negla*
Without, *a'dipi.*
Woman, *ouapr*ⁿ*, sada.*
Wood, *deboa.*
Yellow, *ohapioase.*

III.

THE CHOLONA LANGUAGE

Nothing has heretofore been printed of the language of the Cholonas. This tribe dwells on the left bank of the upper Huallaga river, between 8°–9° 30′ South latitude. They were visited by Edward Pœppig in 1829, when he found them to number about 1000 souls, scattered in missions on the banks of the Monzon, Uchiza, Tocache and Pachiza, small streams flowing into the Huallaga. At the close of the last century they occupied a mission with the Hibitos or Xibitos, and together numbered about 5000.* Pœppig asserts that the Hibitos speak a wholly different tongue, but this is denied by my MS. authorities, who acknowledge only a dialectic difference, but the German traveler is correct in his statement that some of the wild Chunchos of the Sierra belong to the same stock.

My source of information in regard to this language is a MS in the British Museum, entitled *Arte de la Lengua Cholona*. Its author was Fr. Pedro de la Mata, who wrote it in Truxillo in 1748, from which original the MS in question is a copy made by Fr. Geronimo Clota, in San Buenaventura del Valle, in 1772. It is a small octavo of 132 folios and is complete. Fathers José de Araujo and Francisco Gutierrez wrote also *Artes* of these dialects, but I have not discovered their manuscripts. There is also a MS. *Arte de la Lengua Cholona*, apparently anonymous, mentioned by Ludewig, *Lit of Amer Aborig. Langs.*, p. 162

The Cholona is a language extending over a small area, but it seems connected with no other, forming an independent stock. The only analogies worth mentioning which I have noted point towards dialects of the Arawak stock. For instance:

Sun, *muxao*. This seems = *kamu saacha*, "the shining sun," of the Moxos.

Moon, *pel*; allowing for *r* = *l*, this is close to the *pueri* of the Jucuna dialect.

Eye, *sacha*; reminds one of the *sachsi* of the Canamirim, the *saoque* of the Uirina, etc.

Tooth, *ald*; again allowing *r* = *l*, this is the *eri* of the Goajiro.

Black, *saluch* or *chaluch*; *ghulch* in Araicu.

White, *chech*; *gholik* in Araicu

* See my *American Race*, p. [illegible]

Whether these analogies are sufficient to classify it with the Nu-Arawak groups of Von den Steinen is doubtful. The differences in the personal pronouns especially seem to isolate it from the dialects of that stem.

Phonetics

The letters *b*, *d*, *r* and *f* are lacking in the Cholona alphabet. The soft *ch* (as in "choose") alternates with the soft *th*, the latter is represented in the Spanish alphabet by *z*, so that in the *Arte*, *z* and *ch* are interchangeable. Initial *g* is hard before all vowels. The vowel represented by *e* is stated to be between *o* and *u*, and is probably the neutral vowel (as *u* in "but"). The initial *i* seems to represent a slight aspiration, as *iayu* or *hayu*, man. The elements *ñ* and *ñg* appear to be nasals.

The accent always falls on the last syllable, except in some verbal forms, where it is found on the penult. Pœppig says that the sound of the spoken tongue is disagreeable to the European ear.

Nouns

The relations of the nominal theme are indicated by suffixes, which may be arranged to appear like a declension, though not really such.

Nom.—*iayu* or *iayutup*, the man
Gen.—*iayullou*, of the man
Dat.—*iayuke* or *iayuga*, to the man.
Acc.—*iayule* or *iayulu*, the man.
Voc.—*iayuay* or *iayupey* (fem.), O man
Abl.—*iayule* or *tep*, *pat*, *nic*, with or by the man

The plural is formed by the insertion of the particle *lol*, before the case ending

nunlol, the men
nunlolloula, of the men
nunlolga, to the men
nunlolte, the men (accus.)
nunloltep, with or by the men

The case endings are used only when required to render the meaning clear, as *Juantup Pedro ilami*, Juan killed Pedro, where the accusative termination is omitted, that of the nominative sufficiently indicating the relation. Certain particles also give a plural

sense, in which case *lol* is omitted. These are *mer*, all; *pullam*, along with; *comec*, *incomec* and *pemec*, signifying quantity, and *mammiñ*, as many as. Whenever the plural is indicated by the form of the attached pronoun, other plural signs may be omitted.

There is no grammatical distinction of gender in nouns, difference of sex being indicated by the terms *nun*, male; *ila*, female, which may be either prefixed or suffixed, as:

Man, *nunlayu* or *layunun*.
Woman, *ilalayu* or *layuila*.
Boy, *nunpullup*
Girl, *ilapullup*

A neuter or epicene gender can be denoted by a suffixed *ô*, as *munô*, a person.

Various suffixes are added to nouns to modify their meaning, as:

nic, signifying excess or abundance.
mu, signifying absence or negation.
camayoc, indicating knowledge of a subject or practice in it. This word is borrowed from the Kechua.

PRONOUNS.

The pronouns possess the prominence in this tongue which they so frequently show in American languages. All parts of speech can be grammatically inflected by their agency, and they generally suffice to indicate the plural without the insertion of the plural sign, *lol*.

The primitive pronouns are:

I, *oa*.	We, *quija*.
Thou, *mi*.	You, *miaaja*.
He, *sa*.	They, *ohja*.

The separable or independent possessives are formed by adding to the primitives the particle *alou*, with slight euphonic changes:

Mine, *oealou*.	Ours, *quihaqualou*.
Thine, *mimilou*	Yours, *mimilouha*.
His, *sailou*.	Theirs, *chihaloula*

The inseparable possessives are those prefixed to form the conjugation of verbs, and attached to certain classes of nouns. They are as follows:

My, *a*-.	Our, *qui*.
Thy, *m*- (masc.), *p*- (fem.).	Your, *mi*- (both genders).
His (none).	Their, *chi*-.

In the transitions of verbs the pronouns are abbreviated and certain other forms used, as:

	Singular.		Plural.
1st.	*a.*	1st.	*q*, *a.*
2d.	*m* (masc.), *p* (fem.)	2d.	*m*
3d.	*y*, *c*, *v*	3d.	*pa*, *po*, *mo*, *la*.

In adjective nouns the former class are used with euphonic changes, as

pallou, good, a good thing.
amallou, my good or advantage.
mimallou, thy good or advantage.
quimallou, our good or advantage
mimallouha, your good or advantage
chimallou, their good or advantage
amallouaen, it is to my advantage.

The possessives, which form inseparable prefixes to nouns, are united by means of various ellipses and euphonic changes. Example:

Yuca, *el.*	
My yuca, *anel.*	Our yuca, *quenel*
Thy yuca, *menel.*	Your yuca, *menelha*
His yuca, *nel.*	Their yuca, *enel.*

Numerals

The numerals are employed with the addition of particles indicating the nature of the objects counted. The most usual of these particles appears to be *sel* or *chil*. The absolute forms, without these suffixes, are as follows:

1,	*an*	20,	*ip-lec.*
2,	*ip.*	30,	*is-lec*
3,	*is*	40,	*minip-lec*
4,	*minip*	50,	*quioo-lec*
5,	*quioo.*	60,	*ipaoc-lec*
6,	*ipaoc.*	70,	*quili lec*
7,	*quilip.*	80,	*pac-lec*
8,	*pac*	90,	*ooon-loc.*
9,	*ooon.*	100,	*apichao*
10,	*aloc.*		

These offer little resemblance to any other tongue, though the words for 8 and 9 remind one of the Chinchasuyu *pak* and *iskon*.

VERBS.

All active verbs are conjugated by transitions, formed by prefixing the pronoun of the person acting, and inserting immediately after it the pronoun of the person or thing acted upon. Example:

amcollan, I thee love.
maylan, thou me watchest.
paylan, he me watches
asac apuchihun, my food me they give
misac mapuchilan, thy food thee they give (masc.)
pisac papuchilan, thy food thee they give (fem.)
sac hapuchilan, his food him they give.
ysac apahapuchan, their food them I give

These are forms of the verb *apuchan*, to put before one, a derivative from *amchan*, to put, to place. Other examples

amcolecle ameñan, I thee wish to love.
macolecle mimenan, thou me wishest to love
Diosqui ñgolecle quimenan, we wish to love God
Diostup icolecle ymeñan, God wishes to love us.

The variation in the third person plural in the transitions appears to depend on the following conditions:

mo is used when the transition is from the third person singular to the third person plural, as in the expression, "he loves them."

po where the transition is from any of the other persons, singular or plural, to the third plural, as:

apocollan, I love them.
mipocollan, thou lovest them.
quipocollan, we love them.
mipocollan, you love them.
chipocollan, they love them

pa where the verb implies another object besides the direct one, as

ychac apahapuchan, I give them their food.

la is employed when the transition is from the third person plural to some other person than this, as:

micollilatan, they love thee.

chi is confined to transitions from third plurals to third plurals, as:

chipocollan, they love them

Syntax

The construction of phrases will be seen from the following examples:

Liman ni yayu yeip pusimpat aňantumilǎ chectan
Sierra in men their houses straw with covered are
"The houses of the Indians in the Sierra are covered with straw"

The noun *sip* and the verb *anantuman* have their pronouns in the third person plural, so the plural particle *lol* is omitted

The word *chectan* is an abbreviation of *chi actan*, the third person plural of the verb *actan*, I stand, I am in a place. This verb is much used to signify a usual action with reference to a noun, as *cot actan*, I bring water, *sip actan*, I fix or arrange my house, *ayllan actan*, I make the bed, etc

Ňanmac yayu isipte isos pachacotan.
Each Indian his house in his idols keeps.
"Every Indian keeps idols in his house."

English-Choloma Vocabulary

Armadillo, *nas, tacla.*
Bad, evil, *tricaj*
Black, *colunh* or *chal.*
Boy, *nun-pullup.*
Die, to, *colhac.*
Drink, a, *axillam.*
Drink, to, *axtan.*
Each, every, *ňanmac.*
Eyes, *nache.*
Father, *pa*
Flesh, body, *aycha* (K.).
Food, *apuchun.*
Fox, *sup.*
Girl, *ila-pullup.*
Give, to, *allan.*
Good, *pollou*
Green, *llis.*
Hair, *pe.*
Hands, *nen.*
Head, *tuch.*
House, *sip, chip.*
Husband, *muluch*
Idols, *isos, ichoch.*
Lance or dart, *ullac*
Louse, *cullá*
Love, to, *agollan.*
my love, *agole*
my lover, *acoleuch.*
Maize, *cach*
Man (homo), *tayu* or *hayu*
(male), *nun.*
(married), *muluch.*
Moon, *pel.*
Mother, *pan*
Mountain, sierra, *liman.*
Nose, *quesum.*
Not, nothing, *ma.*
Place, to, *amchan.*
Red, *llaca.*
River, *sorat.*
Road, path, *panh.*
Rule, to, *capac* (Kechua)
Sick, *cama.*
Silver, *checke.*
Son, *pul.*
Soul, *call* or *chall.*
Spittle, *olla.*
Stars, *lenna.*

Straw, dry grass, *pusim.*
Sun, *mussac*
Teeth, my, *ald*
Tongue, *monsey*
Town, *pulam*
Water, *cat.*
White, *chaoh.*
Wife, *sala.*
Will, wish, *men.*
  my will, *amen.*
  I wish, *amellan.*
Woman (female), *sla.*
  tlajaya.
  (married), *sala.*
Word, *kil.*
Yuca, *el.*

IV.

THE LECA LANGUAGE

The Lecos of the river Beni have been erroneously included in the Tacana stock by D'Orbigny and later writers (including myself). The only material I have anywhere found of their language is a short vocabulary given in Weddell's *Voyage dans le Nord de la Bolivia* (Paris, 1859), but this is sufficient not only to take them entirely out of the Tacana group, but probably to place them in an independent position by themselves. As Weddell's book is not to be found in many libraries, I shall translate and rearrange his list of words and precede it with some remarks on the tribe and its possible affinities.

The Lecos are stated by Weddell to have resided originally on the Rio Tipuani and its affluent, the Rio Isuaya, whence they removed to the banks of the Rio Mapiri

On Arrowsmith's map (1809) the "Rio de Lecos" is located as a branch of the Rio Beni, between 13° and 14° South latitude, in a region assigned to the "Samachuanes," though I suspect these are the "Muchanes" of other writers, and who, according to Weddell, are Mosotenos

The mission of Aten, in the valley of the Rio Beni, is distinctly stated by an official authority in the last century to have been peopled by the Lecos,* so we must include in them the "Atenianos," whom D'Orbigny classed with the Tacanas.

A somewhat extended comparison has not furnished me with positive grounds for including the Lecos in any known linguistic group. Most of the analogies I have noted are with the Carib stock, and some of them are striking, but scarcely decisive.

* "En Aten se hablan la Leca por ser este Pueblo de Indios Lecos." *Descripcion de las Misiones del Alto Peru*, 1771

Leca Analogies

Sun, *be'ne*; compare *bue'ne* (Opone, Carib stock)
Moon, *kurra*; comp. *keda*, *sirigu* (Carib dialects).
Water, *dua*; perhaps from Carib *tuna*
Arrow, *uela*, not far from Carib *boule'oua*
Arm, *bepel*; close to Carib *yapoule*, *japali*.
Tooth, *bikuri*, nearly the same as the *krier* and *yeri* of Caribs
Heaven, *kout*; almost identical with the Bakairi *kxau* and Carijona *cahoua*, both Carib dialects.
Legs, *boo'te*; comp. Carib *icbeti*, *beti*

I think it is safe to infer from the above comparisons that there is an infusion of Carib elements in the tongue; but the material is too scanty to assign its true value

According to a count made by the missionaries in 1832 there were about two thousand natives at the mission of Aten, all of whom we may assume were Lecos Dr Edwin R Heath, who spent two years in the valley of the Beni about 1880, does not mention them, at least under this name, and gives no specimen of their language.

In personal appearance the Lecos are described (by Weddell) as of pleasant expression, with straight foreheads and horizontal eyes, the mouth of medium size. In temperament they were frank and cheerful. What is unusual, they seemed totally devoid of appreciation or care for music, and had no dances or songs of any kind

The alphabet of the vocabulary is the Spanish, *ü* is the French *u*, *j* as *tscha* in German.

English-Leco Vocabulary.

Arm, *bepel*.
Arrow, *uela*
Belly, *babakobo*
Bird, *kaitchu*
Blood, *bila*.
Body, *benatchae'ro*.
Bow, *tchova'ta*.
Child, *yatchpaik*.
Earth, *lai*.
Eyes, *bieiri*.
Feet, *besel*.
Fingers, *biui*.
Fire, *moa*.
Flower, *sutha*
Forest, *kanda*.
Hand, *bueh*.
Head, *barua*.
Heaven, *kout*.
House, *uaa*.
Leaf, *uoia*.
Legs, *boo'te*
Man, *yubasa*.
Milk, *buchuluro*.
Moon, *kurra*.
Mountain, *uotha*.
Mouth, *behbrua*.

Nails (finger), *bisitâ.*
No, *nai.*
Nose, *bitchinua.*
Rain, *caca.*
River, *dua* (water)
Salt, *tij.*
Skin, *buautcha.*
Sun, *he'ne'*
Tooth, *bikiri.*
Tree, *ba'ta.*
Village, *u'a.*
Water, *dua.*
Woman, *tchunzaya.*
Wood *hamen.*
Yes, *e-e*

NUMERALS.

1, *ber.*
2, *toi*
3, *tahas.*
4, *didai*
5, *ber-taha.*
10, *ber-buqua*

V.

A TEXT IN THE MANAO DIALECT.

Two hundred years ago the Manaos occupied an extensive tract near where the Rio Negro empties its dark waters into the Amazon They were, indeed, the most numerous accolents of the Black river on its lower course, and were estimated at something like ten thousand souls. Their large and shapely canoes and plastered conical dwelling houses bespoke a certain advancement in the arts, and their repute as daring warriors extended far among the Tupi tribes, who adjoined them on the Amazon.

They were not affined in blood or language to the Tupis, but belonged to what is now known as the Arawak or Nu-Arawak (or, as M Adams prefers to call it, the Maipure) linguistic stock In the early history of the country, their name is connected with the legend of El Dorado and the land of the Amazons. Later they willingly received religious instruction from the Carmelite missionaries, who gathered them in settlements. But the kidnapping Portuguese carried off many of the converts into slavery, and the remainder fled to the trackless forests, so that half a century ago scarcely a pure-blood representative of the tribe could be seen on the river.

Of their language there are but two specimens known to me; the one, a vocabulary of about 150 words, collected by the traveler,

Dr. Spix, and published in Martius' *Glossaria Linguarum Brasiliensium;* the other, a short catechetical work, which forms the material of this study, and which has never been printed The original is in the British Museum, Manuscript Department, and bears the title.

"*Doutrina christã a pella Lingoa dos Manaos*"

It has long been known to bibliographers, and is referred to by both Ludewig and Von Martius, but no one has copied or published any portion of it. Its authorship and precise date are unknown, but it has the appearance of a draft or copy of an older work, which it would seem was composed in 1740 The orthography of the Portuguese words is somewhat irregular, and there also seems to be an uncertainty in the spelling of various native terms. The extract which I give is about one-half of the whole, and is sufficient to show the character of the tongue.

A comparison of the words of the text with those collected by Spix about a century later shows little change in the dialect, especially when the difference in the method of transcription is allowed for, the writer of the text having employed the phonetics of the Portuguese tongue, while Spix followed that of the German To illustrate this, and also to facilitate the examination of the text, I append a list of some of the words in the latter, the majority of which are also found in Spix's vocabulary; the latter I have placed in brackets and appended an S

ENGLISH-MANAO WORDS.

All, *sabaqua.*
Always, *lgoaohri*
Be, to, *sahi.*
Believe, to, *yaniqui.*
Belly, *tuba* (*tula*, S)
Body, *cacadyr* (*katy*, S)
Day, *samaco* (*tamàke*, S.)
Die, to, *mulica* (*uamattka*, S.).
Earth, *otudee* (*de'a*, S.)
Father, *yraeary* (*apakeay*, S).
God, *Tupa* (*mauary*, S)
Heaven, *quineuoudae* (*ghinauigela*, S.).
Hell, *caman latyma.*
Man, *keranary* (*yrinàly*, S.)
No, not, *mehe* (*me'e*, S)
Our, us, *oene* (*kuena*, S.)
See, to, *dàbata* (*pipata*, S.).
Sins, *baràyda*
Son, *bauri*, *dayri* (*tany*, S)
Stone, *kyd* (*ghêa*, S).
Teach, to, *cayna.*
Three, *piaduqui* (*plaluky*, S.).
True, *caura.*
Virgin, *cabyra.*
Where? *padeura.*
Why? *capeda.*

Most of these words are derived from roots extending through

many Arawak dialects, and are the property of that stem. Others, however, are borrowed from the Tupi. This is especially so with the word for God, *Tupa*, which is still in use in the Brazilian "Lingoa Geral."

The personal pronouns as given by Spix are:

I, *no*.	We, *huena*.
Thou, *pi*.	You, *yna*.
He, *arouty*.	They, *nela*.

The possessives, however, which are also employed in the conjugations as inseparable prefixes, differ from these. Thus we have:

oë-mequer, our Lord.
oi naca, like us
od-yaniqui, we believe.
od bater, we shall see.
p'yaniqùi, thou believest.
bu batere, they shall see (him)

DOUTRINA CHRISTÁ'A PELLA LINGOA DOS MANAOS

P. De q' sorte se ha de haver o homem neste mundo querendosse livarse do inferno, e querendo hir ao ceo?	P. Oa pada lyanaqui samaco anaqui çamanna tyma gotia, ôâuây ŷápa que rey lyûá kynaueuda diche lyoáyá adaca ûâna?
R. Crendo em Deos, fasendosse baptizar, i guardando sua ley	R. Tupâ yâquer cayta oa lygara anaquyra.
P. Ha Deos?	P. Auûyaâ oa Tupâ?
R. Ha	R. Auûŷnâca.
P. Credes em Deos?	P. Pyanŷqui Tupâ?
R. Cremos.	R. Oâyániqui.
P. Quem he Deos?	P. Capaçay Tupâ?
R. O que fes todas as cousas.	R. Salaqui bayqui tumaquer.
P. Com que fes todas essas cousas?	P. Capâ ûŷna para' Tupâ tuma bayquê sabayque?
R. Com hua' sua so' palavra.	R. Lygâra dŷnapura.
P. Deos tem corpo como nos?	P. Oacadŷra oâuâca Tupâ?
R. Nam tem.	R. Mehê cacaliury.
P. Deos teue antiguamente principio?	P. Oatuquir ha quer rira bauynapu Tupâ?
R. Nam teve principio.	R. Mehê catuquirabaqueri.
P. Sempre soy?	P. Lyxaôâri sahir?
R. Sempre.	R. Lyxaôâri.
P. Ha de ser para sempre?	P. Bayrichipâ sâhi lideuri?
R. Para sempre.	R. Bayricha.

P. Aonde esta Deos?

R. No ceo, e na terra em todo o lugar aonde chamão por elle.

P. Pode o homem ver aqui a Deos?

R. Nam pode ver.

P Porque?

R Porque nam tem corpo.

P. Aonde o hemos de ver?

R. No ceo hindo nos la.

P Eos que sorem ao Inferno nam o hao de ver?

R. Nam o hao de ver.

P Por que rezam?

R Em castigo desus culpas

P. Padeura sabi Deos?

R. Quinaneudeo, etadeo sabaqui panoquer deo, padeno oâcaÿta.

P Sabÿra sabi oâbata caydêo Tupâ?

R. Mehe sabi oâbatar.

P Caÿpeda?

R. Mehe cacasÿr

P Padire ôâbatar?

R Guinacoda dixe guareda ôâbatar.

P Bamane camanhatyma diche gareda babatare?

R. Mehe babatare

P. Capeda?

R Mehe baÿaligara gata ôéney niniqne.

Preguntas sobre a SS Trinidade

P. Quantos Deoses ha?

R. Hu só Deos verdadero.

P. Sendo pessoas quantas são?

R. Sam tres.

P Como se chamao essas tres pessoas?

R. Deos Padre, Deos filho, Deos Espirito Santo

P Aelle se chama santissima Trinidade?

R. Aelle.

P. Porque rezam?

R Porque em hu so Deos estam tres pessoas.

P Esse Deos Padre, Deos Filho, Deos Espirito Santo he o mesmo Deos?

R. He hu so e o mesmo Deos.

P Em quanto pessoas he a mesma pessoas?

R. Nao, em quanto pessoas Deos Padre he differente, Deos filho he differente, Deos Espiritu santo he differente.

P. Qual dessos pessoas antigam[te]

P Paquiby Tupa?

R. Baûrayma Tupa cadra.

P Paquihy lideno paquibÿ

R. Pyaduqui baduqui.

P Capacapa mara qui ÿo piadu qui baduqui-yû?

R. Tupan ÿracâry, Tupan bauri, Tupan Espirito Santo

P Lyciniqui ocna ss. Trind[e] macâ\ ?

R. Lyxiniqui.

P Capoda?

R. Baûray ma Tupa lyanaqui pyaduqui baduqui liâri.

P Baûrayma liôari Tupa ly Tupa yracâry Tupa bayri Tupa Espirito Santo.

R. Baûraÿma Tupa ôárÿ.

P Baûraÿmara sabi lideo baura?

R. Maycadi; bauraymarara Tupa yracari, iÿúnaca Tupa bauri iûynaca, Tupa Espirito Santo iiûÿnaca.

P Padeuora lypa bauÿnapu lypa

soy prº, Deos Padre soy prº ou Deos filho ou Deos Espirito Santo?

R. Nao soy pr, nen hum todos sempre foram.

P Qual dessos pessoas antiguamᵗᵉ foy a q se fez homem como nos?

R. O mesmo filho de Deos.

P. Como se chama o filho de Deos depoy de feyto homem?

R. Nosso senhor Jesus Christo.

P Por isso he, que os Christãos tomaram este nome?

R. Por isso

P Que quer dizer Christaos?

R. O que he bapti zado, entre em Jesus Christo filho Deos

P. Deyxou antigamente N S Jésus Christo outra pessoa em seo lugar antes de hir ao ceo?

R Deyxou s Pedro e todos os Papas seos successores pª governarem a santa madre Igreaja Catolica de Roma assim chamada.

P Que couza he Santa Madre Igreaja Catolica de Roma?

R Sao todos os que sao baptizados, e estao pela palavra do summo Pontifex Papa de Roma, e agvardao e creem em Jesus Christo

P Quem e nosso senhor Jesus Christo?

R. Verdadeyro Deos, e verdadeyro homem, como nos.

P Como he verdadeyro Deos?

R Sendo verdadeyro filho de seo Padre

P Como e verdadeyro homem

R. Sendo verdadeyro filho da sempre virgem Maria.

P. Deos filho tem corpo como nos?

R. Tem corpo.

P Quem fez antigamente o corpo de nosso Senhor Jesus Christo?

Tupa yracary lypa oácaru Tupa bauri oácaru Tupa Espirito Santo?

R. Mebe lyaquyra quariry.

P Capa banynâpe qui-yo pladuquy baduqui di lixir; herenari caurary élanady oênâke?

R Tupan bayri.

P. Capaçay Tupa bauyri-y herénari caurary tûminhâne garêde?

R. Oemequer Jesus Christo

P Lygâyqui câyta Christaos?

R. Lýgâyqui.

P Capaqây caytâra Christaoly?

R. Tupan bâyri catyâca Jesus Christo eyáquêr

P. Nemêda dipa baunâpe ôémequer Jesus Christo baura ôó cuniapây quinaucuda ibxyra gereda f gataya?

R. Nemêda S Pedro sabaque Pay abarepano mâr Simani caydixi santa madre Igreyja catholica mequâr-ey Papa de Roma ôécâyta

P Capacay Santa Madre Igª Catholica de Roma?

R. Sabâque caytâca Jesus Christo eyaquer ligâra abarepano mar Papa de Roma gara anaguyra.

P Capacay ôémequêr Jesus Christo?

R. Tupan caura, herenari caura, aénâca.

P. Capeda Tupa caurâyri?

R. Tupa yrâcari bâyrinŷo.

P Capeda herenari caurayri?

R. Santa Maria ababyoaguereyma dâyri caurayri.

P. Cacadŷra denaque Tupa dayri?

R. Cacadyra.

P Capabaûŷnapê ôómequer Jesus Christo carytumaquer?

R. Nen huma pessoa, o fez por graça o por obra do Espirito santo foy feyto

P. Aonde foy feyto?

R. No ventre de hua donzella chamada Santa Maria

P. E essa Santa Maria ficou sem lesao assim como otra qualqer virgem que nunca parió?

R. Nem mais nem menos.

P E depois de parir ficou sem lesam?

R. Nao teve lezao ficou sempre virgem

P De qũe sorte se houue N. S. Jesus Christo neste mundo de nascer de sua santissima may?

R. Padeceo fo mecede e campaço e todos os malles de pena por amor de nos f por nosso amor.

P. Ensinou antigamente N S. Jesus Christo dando entendimento à gente?

R. Ensinou

P Ao depois morreo na cruz por nos, em paga de nossos peccados?

R. Morreo.

P. Por amor q ᵐ morreo?

R. Por amor de nos, por amor de nossos peccados, ou satysfaçum delles, pᵉlivarnos do Infierno, e levarnos ao ceo.

P Por sua vontade?

R. Por sua vontade morreo.

P Pois elle não hera Deos?

R. Hera Deos.

P. Pois esse morreo?

R. Não: o corpo qᵉtomou de sua santissima may he qᵉ morreo

P. Não havia mos de hir ao ceo, se elle nam morrera?

R. Nao havia mos.

R Mehe capàtomàr Tupan Espirito santo tuma quenda dêo letuminha f graça tumaquenda dêo letuminha

P Padêuora sàhi liâônà?

R. Lymâque sabŷra Santa Maria cayra ababycago erêŷma tubedêo.

P Lyden o Santa Maria enidagareda sabyray ababý cagoeiêyma mehê runida aguyra sayro?

R. Lŷaquira ôâry,

P Lucâôânlquy pura lûy nkdan gaiêda?

R. Mehê rupûta.

P. Capêda ôâmequer Jesus Christo yma samâco anaquŷa lyracâro gaila lynidan gaiêda tayâpa payui garêda?

R. Puâtŷ ŷbûri metaiŷr pe le ly poŷta sabâque bayque pura ly tâ ba û â cadŷ che

P. O aŷna datir baôynapû ô ê mequer Jesus Christo Lita ecaiâya nitia herenari ychy?

R. Recaynâda.

P. Guayneŷpa remotika cruza quadia ô âmâne barâyda ôôney?

R Matica.

P Capeda rematica?

R Oâgâyque ô â m â n e baiâyda ôenêy camânba tymagaila o a u gûŷ yâpaquer quynâudâ llxira eda câydây

P. Pananêy?

R. Pananêyra rematica

P. Mehê sajhe Tupaly?

R. Tupâ.

P Lydêu-ora Tupâ matica?

R. Mehê, tupâ matka caca rŷra liracâro lyxira ba qua lyôâri mati cadŷ.

P Mehê tâma quynaucudâ diche mehe ô â mâtica garêda?

R. Mehê ôâma

P. Quantos dias estenne N. S. Jesus Christo debayxo da terra no teo sepulcro de pedra?	P. Paquyby samáco ōemequēr Jesus Christo lideo rimaticàni gar-ōda etō ūyn à pudōo kŷá anaquya.
R. Tres dias	R. Pyaquibaqui samāco.
P Era depois como passou?	P Guayney padeura?
R. Resuscitou	R. Caydēu-o ocàry
P. Depois de resuscitar como se houve?	P Caydēu o ocàry guaynèy pad-ēury?
R. Subio ao ceo depois de 40 dias.	R. Lycuruca iquinaudadire 40 samáco buiōtiquēy
P De que sorte se ha, ou esta agouria?	P. Paquŷpa sabe cachadir lid ēury?
R Esta asentado à mao dirēyta de Deus Padre tao honrado e estimado como elle.	R Tupan yrácár sabŷdi iibaurày quidēu-o subinha aquidi cáura ymilèta pyrama.

VI

THE BONARI DIALECT OF THE CARIB STOCK.

The last of the Bonaris died about 1870. At one time they were a tribe of considerable strength, having their homes in the thick forests along the river Uatumá, which empties into the Amazon from the north, not far below the mouth of the Rio Negro They were, therefore, neighbors to the Manaos, whose location I have already described

They were a docile people, and readily collected around the mission Father Nuno Alvarez de Couto established at Sant' Anna do Atumá. There, however, they fell victims to various diseases brought by the whites, and when Canon Francisco Bernardino de Louza visited them, of all the tribe only one old woman survived who was able to give him the words of its speech. These he published in his book, *Para e Amazonas* (three parts, 8vo, Rio Janeiro, 1874–5), which is scarce outside of Brazil, and from which Dr. A. Ernst, of Caracas, obligingly copied for me the vocabulary which I subjoin

The name of the tribe is taken from the Tupi language or Lingoa Geral of Brazil, and in its proper form *Boa n-uara* means "snake-men" or "serpent-people" Other *boanari* or snake-men are mentioned, one band on the river Uaupes (Von Martius) and another on the river Içanna (Natterer) It was a term probably derived from the totemic sign, or perhaps from some accidental or fancied peculiarity, and has no ethnic significance.

Even a slight examination proves the Bonari a well-marked Carib dialect, and as such it is correctly assigned and located on Karl von den Steinen's linguistic map inserted in his work, *Durch Central Brasilien.* The only word, however, which he gives from their dialect, *keri*, moon, is not quite correct, according to this vocabulary.

ENGLISH-BONARI VOCABULARY.

Air, *sabu*.
Arrow, *purena'*.
Black, *tapaiuna*.
Bow, *urapa'*
Brother, *mimien*.
Cold, *tecominahoa'*.
Dance, *timiara*.
Ear, *panare'*
Earth, *nono*
Eye, *aurube'*
Fire, *uatu*.
Fish, *uutu*.
Girl, *meacaba'*.
God, *tupan*.
Grandfather, *tamunhd*.
Head, *iriopo'*
Heat, *atupoua'*
Heaven, *maica-paa*.
House, *abene'*.
Husband, *uahò*
Infant, *pitianhoa*.
Light, *ataquica*.
Man, *uquere'*
Moon, *queod*.
Old, *taponou'*
Old woman, *nafouou'*.
Rain, *ounoba*.
River, *tuna'* (see *Water*).
Son, child, *meoo'*
String, *abudiona*.
Sun, *uatu'*
Thunder, *derara'*
Tooth, *jeri*
Uncle, *uamé*.
Water, *tuna*.
White, *tiada'*
Wife, *upuiten*
Wind, *iriane'*,
Woman, *uauri*.

The influence of the neighboring Tupi tribes is seen in such words as *tupan*, God; *tamunhà*, grandfather, *urapa'*, arrow (*urapa'ra*, Tupi); *tiada*, white (*ti*, Tupi); *tapaiuna*, black (*tapan-huna*, Tupi), and a few others more faintly. These are loan-words which do not affect the mass of the language.

VII.

THE HONGOTE LANGUAGE AND THE PATAGONIAN DIALECTS.

Among the manuscripts in the British Museum there is one in Spanish (Add. MSS., No. 17,631), which was obtained in 1848 from the Venezuelan explorer, Michelena y Rojas (author of the *Exploracion del America del Sur*, published in 1867). It contains

several anonymous accounts, by different hands, of a voyage (or voyages) to the east coast of Patagonia, "desde Cabo Blanco hasta las Virgines," one of which is dated December, 1789. Neither the name of the ship nor that of the commander appears.

Among the material are two vocabularies of the Tsoneca or Tehuelhet dialect, comprising about sixty words and ten numerals. These correspond closely with the various other lists of terms collected by travelers. At the close of the MS., however, there is a short vocabulary of an entirely different linguistic stock, without name of collector, date or place, unless the last words, "á la Soleta," refer to some locality." Elsewhere the same numerals are given, and a few words, evidently from some dialect more closely akin to the Tsoneca, and the name *Hongote* is applied to the tongue. This may be a corruption of "Choonke," the name which Ramon Lista and other Spanish writers apply to the Tsoneca (Hongote = Chongote = Choonke = Tsōnēca)

The list which I copy below, however, does not seem closely allied to the Tehuelhet nor to any other tongue with which I have compared it.

The MS. is generally legible, though to a few words I have placed an interrogation mark, indicating that the handwriting was uncertain. The sheet contains the following.

DESCRIPCION DEL INDIO.

Caveza,	*acyocup*
Frente,	*cysean*
Ojos,	*oan.*
Orejas,	*coane* (qy *coaue*)
Narizes,	*bacsen.*
Cejas,	*sieman.*
Boca,	*susia.*
Dientes,	*idle*
Pescuezo,	*asielan.*
Brasos,	*chaslan.*
Manos,	*cupa'chas.*
Dedos,	*padyecoye.*
Barriga,	*coaa'.*
Muslos,	*caua'*
Pierna,	*ousia.*
Pie,	*pasasen*
A las conchas,	*chasin* (?)
Cuchillos,	*chosd.*

1,	*po.*
2,	*so.*
3,	*sholas*
4,	*bek.*
5,	*cleche.*
6,	*tosan.*
7,	*soke.*
8,	*tache.*
9,	*teus* (?)
10,	*e'pen.*

No le he podido entender mas.

Canoa,	*tasabay*
Canaleta,	*asaup.*
Toda clase de botones,	*coyocuy*
Abalorios.	*jamts* (?).

A la Soleta

The above list I translate and arrange in alphabetical order as follows:

Arms, *chalan.*
Beads *jamts* (?)
Belly, *coya'.*
Buttons, *coyocuy.*
Canoe, *tasabay.*
Ears, *coana* (or *coaua*).
Eyebrows, *tuman.*
Eyes, *caa.*
Fingers, *gaayocoya.*
Foot, *pasasen.*
Forehead, *eysem.*
Hands, *oupa'ches*
Head, *asyocup*
Knives, *chast.*
Leg, *carin.*
Mouth, *ssrin.*
Neck, *ssislan.*
Nose, *bocsen.*
Paddle, *asaup.*
Teeth, *idie.*
Thighs, *casa*

The other vocabulary, although it presents the same numerals, differs widely in some of the words. It gives.

Fire, *banibark.*
Water, *cuk hin.*
Sun, *kekor.*
Woman, *keook.*
Eyes, *kasak.*
Ears, *kaluch*
Mouth, *kakke.*
Tongue, *kakshlät.*

These are more closely akin to other Patagonian dialects than the words of the former vocabulary.

It must be acknowledged, however, that we are but poorly supplied with information about the tongues of Patagonia and Tierra del Fuego. In the latter country we have, indeed, sufficient material in the Yahgan, thanks to Brydges, Adam and others; but in

the Onas tongue there is practically nothing and but little of the Alikuluf.

It is still uncertain whether the last mentioned is a branch of the Yakana cunny, and whether these latter in turn differ from the true Patagonian or Tehuelhet.*

D'Orbigny insists that the Puelches, who have for a century and a half occupied the plains between the Rio Negro and the Rio Colorado (39° to 41° lat. South), are radically different in language both from their Aucanian neighbors to the north and the Patagonian tribes to the south.† For this reason they are called by the Araucanians *Quimnolu-che*, "People who cannot understand."‡ D'Orbigny's short comparative vocabulary of the "Patagon" and "Puelche" certainly reveals a wide difference, but a comparison of the few words of "southern Puelche" collected by Hale discloses unmistakable identities between the two idioms, as.

	S. Puelche.	Tehuel-het.
Star,	*aχalela,*	*taŏkalrla.*
Tree,	*apa,*	*apuk.*
Bone,	*ohatsk,*	*okit.*

Mr. Hale collected his vocabularies at Carmen, on the Rio Negro; and the influence of the northern tribes is distinctly visible in them. Especially the Guachi would seem to have percolated into them. The possessive pronoun of the first person singular, *ia* or *ya*, "my," is seen in both Hale's vocabularies and also in D'Orbigny's Puelche It is common to the Tsoneca or Tehuelhet and the Guachi.

	Guachi.	Teh. or Puelche.
Nose,	*ia-note,*	*ia-nots*
Water,	*euak,*	*yagup*
Mouth *or* lips,	*ia-pé,*	*ia-pelk.*
Teeth,	*ia-oo,*	*ia-hoi.*
Mountain,	*tegeo lean,*	*aterq, yuilhuana*

The Poyas or Pey-yus are stated in the *Informe* of General Pietas, above quoted, to have dwelt (in 1729) from the river Lauquen-leufu one hundred leagues southward and quite to the Atlantic. Twenty-five years ago Guinnard found the "Poyu-che," as he calls them, wandering along both banks of the Rio Negro from Pacheco Island

* The writers of the *Mission Scientifique au Cap Horn* identify the Onas with the Yakana-cunny, and assert that they speak a closely related dialect of Patagonian.

† *L'Homme Américain*, Tomo II, p. 71

‡ *Informe* of Don Geronimo Pietas, 1729, quoted by Dr. Darapsky in the *Bull. del Instituto Geographico Argentino*, Tomo x, p. 278.

to the Cordilleras.* The words he gives from their tongue—if they can be depended upon—prove it to be an Araucanian dialect.

Of the Chonos, who were a maritime people on the west coast, we have no linguistic material, nor can we define the relationship of the Calen and Taljatef, who resided on the shore south of 48° and spoke one tongue.

In the following table I present a comparison of a limited number of common words in Patagonian vocabularies, beginning with the earliest—that collected by Magellan on his first visit to the straits that bear his name, in 1520 It is interesting to note how little the language has changed in the nearly four centuries which have passed since that period. The list is found in Pigafetta's narration.

Dialect	Author.	Man	Woman.	Sun	Moon
1 Patagonian,	Pigafetta,			*calexcheni,*	
2 "	MS Br Mus I,	*auken,*	*ai ke,*	*kere,*	*aswana,*
3 "	MS Br Mus II,	*aukra,*	*ninam,*	*kelmua,*	*amania,*
4 "	Martius,	*aulen,*	*ninam,*	*shuim,*	*amania,*
5 "	D'Orbigny,	*nuen,*	*nauwai,*	*chuina,*	*chuina,*
6 Tsoneca,	Hale,	*kéna,*	*vamo kuadia,*	*apiuxk*	
7 Choonke or Tehuelche, or	Musters,	*ahouleom,*	*karken,*	*gengenko,*	*shouman,*
8. Tehuelhet,	Lista,			*gengenekin,*	*shegucmon,*
9. Puelche,	Hale,	*kme,*	*yamo kamok,*	*tpiaxtatoin,*	*apikok,*
10. "	D'Orbigny,	*chia,*	*iam-kat,*	*apiucua,*	*pion,*
11 Hongote,	MS Br Mus I				
12. "	MS Br Mus II,		*beruk,*	*krikur,*	
13 Tekeenika (or Yahgan),	Brydges,	*won,*	*kipa,*	*lum,*	*hanuuka,*
14. Alikhulup,		*akinish*	*ackhanash*	*lum*	*cunnequa*

Dialect	Author	Fire.	Water.	Head.	Eye.	Ear.
1 Patagonian,	Pigafetta,	*gialeme,*	*holi,*	*her,*	*oter,*	*ame,*
2. "	MS Br Mus I,		*jorma,*	*gah,*	*guul,*	*jene,*
3. "	MS Br Mus II,	*hamonaku,*	*karra,*	*gulal,*	*gotil,*	*shene,*
4 "	Martius,	*hamonaku,*	*karra,*	*gual,*	*gottel,*	*shene,*
5. "	D'Orbigny,	*mapa,*	*ara,*	*dil,*	*gatr,*	*jene,*
6. Tsoneca,	Hale,	*hamakok,*	*lagup,*	*tagoka,*	*kadik,*	
7 Choonke or Tehuelche or	Musters,	*yeik,*	*lay,*	*kittar,*	*ot,*	
8 Tehuelhet,	Lista,	*yelle,*	*lehe,*		*otel,*	*shaa,*
9 Puelche,	Hale.	*atxok,*	*iagup,*	*le'ae,*	*latrike,*	*talmak,*
10. "	D'Orbigny,	*aquacake,*	*iagup,*	*lacaa,*	*ittico,*	*taryegin,*
11. Hongote,	MS. Br Mus I			*arpucap,*	*cau,*	*cnana,*
12. "	MS Br Mus II,	*keutkok,*	*kalkin,*		*kavak,*	*kakul,*
13. Tekeenika (or Yahgan),	Brydges,	*puahaly,*	*shamea,*	*lukabe,*	*della,*	*ufkiva,*
14. Alikhulup		*tetal*	*chanash,*	*of'chorka*	*telkh*	*tekdi*

* A. Guinnard, *Three Years among the Patagonians*, p. 49 *et al.* (Eng trans, London, 1871) The prayer he inserts in some dialect not clearly stated on p. 103 is almost pure Araucanian, as are the numerals on p 261 It is doubtful if he was ever among the true Patagonians (the Tehuelhet).

DIALECT	AUTHOR.	MOUTH.	NOSE.	TONGUE.	TOOTH.
1 Patagonian,	Pigafetta,	*chian*,	*or*,	*schial*,	*for*,
2 "	MS. Br Mus. I,			*ffeni*,	*for*, *hor*,
3 "	MS. Br Mus II,		*A*,	*del*,	*horr*,
4 "	Martius,		*on*,	*del*,	*orr*,
5 "	D'Orbigny,	*thum*,	*ho*,		*for*,
6 Tsoneca,	Hale,	*tapuh*,	*[illegible]*,		*[illegible]*,
7 Choonke or Tehuelche, or	Musters,		*tchal*,	*tal*,	*orr*,
8 Tehuelhet,	Lista,	*ahaltre*,	*or*		*orre*,
9 Puelche,	Hale,	*tapuk*,	*[illegible]*,	*[illegible]*,	*[illegible]*,
10 "	D'Orbigny,				
11 Hongote,	MS Br Mus I,	*[illegible]*,	*bacern*,		*idia*,
12 "	MS Br Mus II,	*[illegible]*,		*[illegible]*,	
13 Tekeenika (or Yahgan),	Brydges,	*yeak*,	*[illegible]*,	*lün*,	*[illegible]*,
14 Alikulof		*uffcarr*,	*nohl*.	*[illegible]*.	*[illegible]*.

DIALECT.	AUTHOR.	HAND.	FOOT	HOUSE.	ONE.
1. Patagonian,	Pigafetta,	*chéné* (*cori*, fingers),			
2 "	MS. Br Mus. I,	*fun*,	*hei*,	*corha*,	*[illegible]*,
3 "	MS Br Mus II,	*ore*,	*hei*,	*cocha*,	*[illegible]*,
4 "	Martius,	*ore fun*,	*kral*,	*cocha*,	*[illegible]*,
5 "	D'Orbigny,	*chémé*,	*il*,		
6 Tsoneca,	Hale,				*tçie*,
7 Choonke or Tehuelche, or	Musters,	*[illegible]*,	*[illegible]*,	*kou*,	*chuche*,
8 Tehuelhet,	Lista,		*all*,		*chuche*,
9 Puelche,	Hale,	*[illegible]*,	*[illegible]*,	*ahotke*,	*tçi*,
10 "	D'Orbigny,	*[illegible]*,			
11 Hongote,	MS. Br Mus. I,	*[illegible]*,	*[illegible]*,		*pu*,
12 "	MS. Br Mus. II,				*pu*,
13 Tekeenika (or Yahgan),	Brydges,	*[illegible]*,	*[illegible]*,	*[illegible]*,	*[illegible]*,
14 Alikulof		*[illegible]*.	*[illegible]*,	*[illegible]*,	*[illegible]*

DIALECT	AUTHOR.	TWO.	THREE.	FOUR.	FIVE.
1. Patagonian,	Pigafetta				
2 "	MS. Br Mus. I		*[illegible]*,	*[illegible]*,	*[illegible]*,
3 "	MS. Br Mus. II,	*[illegible]*,	*[illegible]*,	*[illegible]*,	*[illegible]*,
4 "	Martius,	*[illegible]*,	*[illegible]*,	*[illegible]*,	*[illegible]*,
5 "	D'Orbigny,				
6 Tsoneca,	Hale,	*[illegible]*,	*[illegible]*,	*[illegible]*,	*[illegible]*,
7 Choonke or Tehuelche, or	Musters,	*houke*,	*aäs*,	*[illegible]*,	*ktsen*,
8 Tehuelhet,	Lista,	*[illegible]*,	*[illegible]*,	*[illegible]*,	*[illegible]*,
9 Puelche,	Hale,	*[illegible]*,	*[illegible]*,	*[illegible]*,	*[illegible]*,
10 "	D'Orbigny,				
11 Hongote,	MS Br Mus. I,	*[illegible]*,	*[illegible]*.	*[illegible]*.	*[illegible]*,
12 "	MS. Br Mus. II,	*[illegible]*,	*[illegible]*,	*[illegible]*,	*[illegible]*,
13 Tekeenika (or Yahgan),	Brydges,	*[illegible]*,	*[illegible]*,	*[illegible]*,	*[illegible]*.
14 Alikulof		*[illegible]*.	*[illegible]*.	*[illegible]*	

NOTES ON THE VOCABULARY.

Man.—The root in all the allied Tsoneca dialects is *ken*, *kin* or *kan*, which is the generic term for the species *homo*. It is seen

with a feminine prefix in *iamo-kan-ak*, *kärken*, *ackkanash* (= *wa-kan-ash*). The English form of this root becomes *cunny*, found as a suffix to various tribal names.

Woman.—*Zunum* = woman, as *zunum naken*, ugly woman, *zunum kekalun*, girl, young woman; *iama* or *yama* means properly "mother;" *acke* or *ysher* (Musters) is a woman of the same gens, the masculine form of which is *chen*, brother; *karken* is a married woman.

Sun and Moon.—The two prevailing roots are *kar* and *shuin*. They both appear in Pigafetta's *calexchem* (= *kare-shuin*). The vocabulary No. 2 translates *kora* as "sun, heaven, God." The generic term for both orbs is *shuin* (*chuina*), which seems allied to the Araucanian *cuyen* of the same meaning. The Hongote *ke kar* shows the radical *kar*. Another radical for both orbs is the guttural sound variously represented by *kok*, *cur*, *yok*, *keng*, *geng*, *sheg*. According to Brydges the Yahgans have two different words for sun, *lum* and *usteca*, and two for moon, *annuca* and *kunian*.

Fire.—The radical sound appears to be '*auaχ*, spelled variously *yaik*, *hauak*, *kauik*, etc. The first syllable is visible in *maja* = *ma yaχ*.

Water.—The term *jarra* or *karra* means "drinking water," from *jara*, to drink; *sagop* is rain water (*clagop*, rain, Hale); the *liy* and *leke* of Musters and Lista appear to be an abbreviation of the *ho li'* of Pigafetta.

Head.—Pigafetta's *her* = *hel*, which is a variant of *gull*, *dil*, etc. Another radical for the idea is a guttural, '*χo*, which is at the base of *ta'oe*, the Hongote *se-yocup*, Yahgan *luka-be*, etc. (comp. Araucanian *lonco*, head).

Eye.—All the words are clearly related except the Hongote.

Ear.—The term given by Pigafetta, *sané*, is repeated with slight variation in the various dialects including the Hongote, except the Puelche, where Hale and D'Orbigny give a different word. The verb *chalnqué*, to hear, seems related to *shené*, ear.

Mouth.—Wide discrepancies appear in the terms for this organ. The words *chian*, *shakan* and *shum* are probably forms of *shum*, which is the right word for mouth, while *ia pelk*, according to Hale, means "my lips."

Nose.—The general root is a modification of *o*, Lista's *or* = *ob*, which reappears in *lochal*, *nbhl*, etc.

Tongue.—Pigafetta's *scial* reappears in Muster's *tal*, etc.

Tooth.—The prevailing radical *or* may be related to Araucanian *or*, bone

Hand.—Two conceptions are conveyed by the words presented, *ché'mi, ché'ne, jan, fan*, all forms of the same = upper extremity, arm and hand; while *or, cori, tsic-c'r, ya-s'k'cup* all refer to the fingers.

Foot.—The general root *kel* probably reappears in *'aly*, and even in *shan-kence* (= *chen-kels*, lower extremity), *culli-kulkul*, etc.

House.—The root is generally *ko'a*.

Numerals.—These display considerable diversity. Several are merely borrowed from the Araucanian, in which we have: 1, *quilu*, 2, *epu*, 3, *cula*, 4, *meli*, 5, *kechu*. From *kechu*, for instance, comes Hongote *cieck*, Tel. *keitaun*, *tsen*, etc. Hong. *chalas* probably = Tel. *ka-ash*, Hong. *sa* = Tel. *tci*, etc.

The general conclusion to which these comparisons lead is that the Patagonian dialects are probably more closely related than has hitherto been assumed.

VIII.

THE DIALECTS AND AFFINITIES OF THE KECHUA LANGUAGE.

At the time of the discovery, and probably long before that date, the Kechua language was spoken along and near the Pacific coast from 3° North to 35° South latitude, that is from the Rio Ancasmayu in Ecuador to the Rio Maule in Chili.

Of course, in this long extent of nearly twenty-five hundred miles of mountains and deserts, there was considerable variety in its dialects; but, so far as I can learn, much less than might be expected at first sight. The Abbé Camaño, a learned Jesuit who traveled extensively in Peru about the middle of the last century, and whose *Elementi della Lingua Quichua* has never seen the light in print, classified the tongue under five dialects as follows:

1. The Chinchasuyo, spoken in the diocese of Lima.
2. The Lamaño, spoken about Lamas, in the diocese of Truxillo.
3. The Quiteño, current in and around the city of Quito.
4. The Calchaqui or Tucumaño or Catamareño, which prevailed west of the Cordillera in the province of Tucuman.
5. The Cuzcuaño, in and around Cusco.

Of these the last mentioned is that which is considered the

classical, and was adopted by the missionaries as representing the language in its purest and most ancient form. In it the drama of *Ollanta* was composed, which is justly regarded as one of the finest productions of American aboriginal literature.

The identification of the Calchaqui dialect of Tucuman with a patois of the Kechua would settle a vexed question in American ethnography and archæology. The language and the nation of the Calchaquis have long since disappeared, but their material relics, in the shape of well-constructed walls of dressed stones, tombs of the same material, ornaments and images in copper and gold, and handsomely decorated jars of earthenware, still remain in sufficient abundance to testify to a condition of culture among them rivaling that of the Kechuas of the western slope of the Cordilleras.*

The learned traveler, Von Tschudi, imagined that their tongue was the modern Atacameño, and that these sparse inhabitants of the desert were descendants of refugee Calchaquis.† But there is no actual evidence to this effect.

Florentine Ameghino, who has done so much for our knowledge of the Argentine Republic, claims the Calchaqui as a dialect of the Aymara tongue of Bolivia;‡ and the two latest writers on the subject, S. A. Lafone Quevedo and Dr. H. von Ihering, are equally at issue in their opinions. The latter insists that the Calchaquis spoke an idiom wholly different from either Kechua or Aymara,§ while the former argues that this extinct tongue was "not exactly Kechuan, but not altogether distinct" from it, and was a mongrel dialect made up of Kechuan, Abiponian and Guaranian elements.‖

When we turn to the old authorities the point is by no means cleared up. The first and best who states anything definite is the Jesuit missionary, Alonso de Bárzana (sometimes written Barcena), whose letter from "Asuncion del Paraguay," dated September 8, 1594, gives some pertinent particulars. He writes: "The most widely extended languages (in Tucuman) are the Caca, the Tonocote and the Sanavirona. The Caca is spoken by the Diaguitas and throughout the valley of Calchaqui, and that of Catamarca, and in most of the district of Nueva Rioja. Nearly all the towns

* See authorities quoted in my work, *The American Race*, pp. 319 seq.

† *Reisen in Süd-Amerika*, Vol. v, p. 81; *Organismus der Khetsua-Sprache*, p. 71.

‡ Ameghino, quoted by Ihering.

§ In *Das Ausland*, 1891, p. 944.

‖ "Notes in the Calchaqui Region," in the *American Anthropologist*, October, 1891, p. 353.

about Santiago use it, as well as the natives along the Rio de Estero, and many more who live in the mountains. I have prepared a grammar and vocabulary of this language."*

These statements assign a distribution of the language over an area about 450 miles from east to west, and 300 miles from north to south. It is highly unlikely that so widespread a tongue should utterly disappear while so many of the descendants of those who spoke it still survive. Yet the native population of Tucuman to-day speak only a corrupt Kechua dialect, when not Spanish. In fact, the name applied to the tongue by Bárzana, *kaka*, is the Kechua word for mountain, and signifies in this connection the dialect of the mountaineers.

The grammar and vocabulary he prepared are lost, and we have no monuments of the language remaining, except the geographical and other names mentioned in the early writers or preserved on old maps. In examining these one is at once struck with the numerous names of villages ending in *-gasta*. These are found from the Rio Salado to the Cordillera, and from about 26° 30′ to 31° 30′ South latitude; in other words, in just about the area assigned by Bárzana to the Caca tongue.

I quote some of them:

Ambargasta,	Guanagasta,
Amingasta,	Machigasta,
Auguagasta,	Paquilagasta,
Cahgasta,	Tinogasta,
Callingasta,	Tuquiligasta.
Chiquiligasta,	

I do not think there can be any doubt but that this *gasta* is a corrupted form of the Kechua *llacta*, town or village. In pure Kechua there is no *g* sound, and the *c* is a guttural (German *ch*); so that a rough equivalent in the Spanish alphabet would be close to *gasta*. Moreover, many of the syllables preceding the termination are evidently Kechua, as:

Cahgasta = *caja llacta*, cold town; an appropriate name, as it lies high up the Cordillera on the Rio de Limari.
Auguagasta = *aucca llacta*, enemies' town, occupied by hostile people.
Callingasta = *ccali llacta*, healthy town, probably from its salubrious site.

* Bárzana's letter is printed in the *Relaciones Geograficas de Indias, Peru*, Tomo II (Madrid, 1885).

Machigasta = *macchhy llacta*, washing town, place where large solid things are washed; quite suitable to the village of the name on the eastern end of Lake Andalgala.

The Kechua origin of these names is plain. But if the Caca or Catamareño, as it is sometimes called, was merely a dialect of the Kechua, why did Bárzana speak of it as a separate tongue? Possibly because the differences in sound were so great as to render it unintelligible to a person familiar only with the dialect of Cuzco

For the present the evidence seems sufficient to consider the Calchaquis a more or less mixed branch of the Kechua family, and the supposition formerly advanced by myself and others that they constituted an independent stock seems unwarranted.

The Quiteño dialect was held by Von Tschudi to present features of higher antiquity than that of Cuzco. So far as I know, there are few published specimens of it.*

The Chinchasuyu or Chinchaya dialect, also one of the northern branches of the tongue, has been sufficiently analyzed by Von Tschudi in his work on the language, his materials being drawn from the Appendix to the second and third editions of Diego de Torres Rubio's *Arte de la lengua Quechua*, and from the manuscripts of the German engineer, Hermann Göhring.† He finds the pronunciation softer. Certain differences in the verbs appear, in part, to be neologisms. And there is a rather large number of words which are wholly diverse in the two dialects.

The Lamaño is said by Von Tschudi to be closely allied to the Quiteño, but he acknowledges that he was not personally familiar with it.

Whether the Incas, that is, the gens from whom the war and peace chiefs were selected, had a language or dialect peculiar to themselves, as asserted by Garcilasso de la Vega—and by nobody else—has been again brought up for discussion lately by Dr. E W Middendorf. He maintains that they had, and that this secret language was the Aymara.‡ This he does in the face of the fact that every one of the eleven words which Garcilasso quotes from this mysterious tongue turns out either to be pure Kechua or from a

* An *Arte*, printed at Lima in 1753, of this dialect, is mentioned by Ludewig, *Lit. of Amer. Aborig. Langs.*, p. 162.

† *Organismus der Khetsua Sprache*, Einleitung, p. 65.

‡ See the Introduction to his work, *Das Runa Simi oder der Keshua-Sprache* (Leipzig, 1890).

Kechua radical.* Dr Middendorf holds his opinion not so much on the evidence, as to support his favorite theory that the Kechua civilization was derived from the Aymaras and that the Inca gens was of Aymara descent. Unfortunately, he has not acquainted himself with the real constitution of the Kechua social system. It has been ably and satisfactorily analyzed by Dr. Gustav Brühl † and later by Heinrich Cunow ‡

The precise relationship of the Aymara language to the Kechua has received considerable further elucidation through Dr. Middendorf's recent studies. He supplies a list of about five hundred and seventy words, which have approximately the same form and sense in the two tongues, and a second list of about one hundred words which are alike in form but with more or less variation in sense. There is also a strong phonetic likeness between the tongues, and their grammatical characteristics approach each other. His conclusion is that "Aymara and Kechua are sister languages, but are like children of mixed marriages, for while they agree in their essential nature (in ihrem Wesen) quite to the most trivial peculiarities, yet in external grammatical form, as well as in the larger part of their vocabulary, they are wholly asunder." §

This is substantially the conclusion reached by that master of linguistic science, Prof H. Steinthal, who has ably explained the identities and diversities of these two tongues on principles of the general philosophy of language ‖

It is probable that further light would be thrown on this question, so interesting for the information its settlement would yield on the origin of Peruvian civilization and the archæology of the region around Lake Titicaca, were the comparison instituted between the oldest, and therefore purest, forms of the two tongues; and it is partly to call attention to some rare or unpublished materials suitable for this purpose that I have introduced the subject.

* Von Tschudi, *Organismus der Khetsua-Sprache*, Einleitung, s. 66. Wilhelm von Humboldt was the first to identify the words adduced by Garcilasso as members of the Kechua

† Gustav Brühl, *Die Culturvölker Alt-Amerikas* (Cincinnati, 1887)

‡ "Das peruanische Verwandtschaftssystem und die Geschlechtsverbände der Inka," in *Das Ausland*, 1891. As to the "secret language," Cunow says, after discussing what words of it we find in Garcilasso—"Man sieht, von einer Geheimsprache kann keine Rede sein."

§ See Dr E W Middendorf, *Die Aimará Sprache*, s 286, seq (Leipzig, 1891), and *Das Runa Simi oder der Keshua-Sprache*, s. 25 (Leipzig, 1890).

‖ "Das Verhältniss zwischen dem Ketschua und Aimará," in the *Compte Rendu* of the Congrès des Américanistes, 7me Session (1888), p. 462.

Assuming with most Kechuists that the trend of migration was from north to south, we should look towards the north for the oldest forms of the tongue. This, as I have said, Von Tschudi did; but both he and Dr Middendorf state that they had not seen the work on the Quiteño dialect printed at Lima in 1753, nor apparently any MS. on the structure of the northernmost branches of the tongue.

A vocabulary is mentioned by Von Tschudi, dated in 1814, which gives words of the idiom as spoken in the dioceses of Maynas and Ucayali.

This could be supplemented by a later MS. in my library, containing a *Diccionario castellano-inga (y inga castellano) segun se habla en las montañas limitrofes del Ucayali* and a *Gramatica del idioma Inga acomodado al modo de hablar de los manaitas y Maynas*. It is dated 1868, and the author is given as Fr. Mariano Castellansuelo; but it appears, in part at least, to be founded on some earlier work.

A comparison of this MS. with the grammars of Von Tschudi and Middendorf shows that the dialect of Maynas, the most eastern of all the Kechua dialects, is more closely akin to the Cuzceño than to the Quiteño, both in vocabulary and structure It does not present the terminal *nga* to the verbal stem, common in the latter. In vocabulary it is nearer the classical Kechua than to the Chinchaya, for example

	MAYNAS.	KECHUA OF CUZCO.	CHINCHAYA.
Town,	*llacta,*	*llacta,*	*marca.*
Head,	*uma,*	*uma,*	*peka.*
Water,	*yacu,*	*unu,*	*yacu.*
Small,	*uchuccla,*	*huchucla,*	*ikchecla.*
Cold,	*chire,*	*chiri,*	*cahcha.*

For the Aymara, the comparison should be made with its purest form. This was confessedly the Pacasa dialect and not the Lupaca, in which the *Arte* and *Diccionario* of Bertonio were composed. At present, although the distinction between the dialects has been in a measure erased by the facilities of modern intercourse, there remain extensive variations both in grammar and vocabulary * The excellent work of Dr. Middendorf is founded on what purports to be the Pacasa; and in the Brown Library, at Providence, there is a modern folio MS. by D B. de Merian, entitled *Historia D. N.*

* Dr E W Middendorf, *Die Aymará-Sprache*, Einleitung (Leipzig, 1891).

J. C. in Linguâ Pacasâ It contains the original and an interlinear translation in Latin I quote the following passage as an example:

TEXT IN THE PACASA DIALECT OF THE AYMARA LANGUAGE.

Ancha hacha llaquiñapana keriñapa ella humppiñapas
Summæ afflictionis suæ agone suo, sanguineo sudore suoque fialio
tacculatha collna Jesusa ciati carcia uraquetha
divinus Jesus valdé fatigatus de terra surgens,
sartuwina yatichatanacparu cutiniwa.
ad discipulos suos redilt Verum eos valdé dormientes
Maasca acanaca conti iquesquiri harjatasiña parajlayana
deprehendens, eos excitavit, dicens "Surgite! Jam enim venit
sasona sartupjama ninpilla puri alfirihaja
venditor meus quomodo vos dormitis? non videtis
lomisaraqui humana caya iquisipjiquata hanati
quomodo inimicus meus non dormit, sed Judæorum in manus
ullingyia, camisa aucahaja hanihua iquiti,
suas ad tradendum me jam adest?" Verum, divino Jesus,
maasca Judiona cana amparanacparu catuyaña hallaqui
non solum de discipulis tuis conquerere, de hujus urbis incolis
niahua piori! Maasca collana Jesusay haniqui
etiam conquerere, qui in omnibus et singulis animas
yatichatanamatha quejasirats aca marca haqucnacatha.
suas salvandi rebus semper dormiant, semper otiosi sunt.

(From the *Historia D N J C in Linguâ Pacasâ, diocesis urbis de la Paz. Descripsit D B. de Merian.* MS folio)

IX.

AFFINITIES OF SOUTH AND NORTH AMERICAN LANGUAGES.

The first scientific attempt to show a connection between South and North American languages was that read by Dr. Max Uhle before the Congrès des Américanistes at Berlin in 1888, and published in the *Compte Rendu* of that association. It was confined to demonstrating a relationship between the Chibcha dialects of northwestern South America to the Costa Rican dialects, which have been so fruitfully studied by Gabb and Thiel.*

* I have summarised the evidence in *The American Race*, pp 184–188. I do not overlook the Rev William Herzog's article in the *Archiv für Anthrop.*, 1884, entitled, "Ueber die Verwandtschaftsbeziehungen der costaricensischen Indianer-Sprachen mit denen von Central- und Süd Amerika," but it does not take up the subject in a scientific manner, and hence its results are unsatisfying.

Still more recently an effort has been made by Dr A. Ernst, of Caracas, to establish a linguistic connection between the dialects of the Timote stock, who occupy the Cordillera in the district of Mérida (8° N lat.), and the Costa Rican dialects, thus bringing the Timotes into the Chibcha stock, as he expressly claims. He goes yet further and seeks to discover verbal identities between the Timote and the Guatuso, spoken in Nicaragua on the Rio Frio. The latter is not supposed to be related to the Costa Rican dialects, which makes Dr. Ernst's theory the more important could it be substantiated. He has published a list of forty-five words in an article in the *Boletin del Ministerio de Obras Públicas* for April 8, 1891 (Caracas, Venezuela), on which he bases his claim. I translate and arrange these words, and shall examine the alleged analogies.

Supposed Affinities between Timote, Costa Rican and Guatuso Words.

	Timote Stock.	Costa Rican Stock.	Guatuso.
Man,	*osar*,	*caga*, *caca* (father)	
Woman,	*curaum*,	*ra cur*,	*curisa* (female)
Wife,	*carigura*,		*curijuri* (woman).
Mother,	*shugria*,		*aku*.
Man, white,	*ticep*,	*sudi*,	*otshapa* (señor)
Woman, white,	*ticiura*,	*sobra*.	
Child,	*timdo*,	*tstamura* (little)	
Boy,	*sori*,	*hara*, *tshaasera*,	*aroptshaura*
Brother,	*cushia*,	*ayi*, *tshi*.	
Head,	*kitsham*,	*hotshen* (a point).	
Mouth,	*macabé*,		*macokica*
Tongue,	*shiblo*,	*kerkue*	
Foot,	*cují*,	*bukuré*.	
Fire,	*shirup*,	*yue*, *iyue*, *tshiora*.	
Water,	*shimpue*,	*dirua* (a torrent)	
Stone,	*titsup*,	*i dku-ook*,	*capí* (hard)
Wood,	*tiory*,	*dshi-shiba*	
Salt,	*shapí*,	*tshaba* (pepper)	
Meat, Flesh,	*shores*,	*sustaris* (deer).	
Skin,	*mishu*,		*maiba*.
Animal,	*tisaghai*,	*agua*.	
Dog,	*tsirki*,	*shiki*.	
Snake,	*sui*,	*shuak*.	
Flea,	*tisa*,	*shiba*.	

	Timote Stock	Costa Rican Stock	Guatuso
Scorpion,	*tšipui,*	*ïröh.*	
Hawk,	*kui,*		*sui.*
Egg,	*shioopo,*	*oup, írup*	
Pepper,	*sioas,*	*shiboh, tshoba*	
Maize,	*shipyae,*	*eupas* (cornfield).	
Bread,	*suridipa,*	*ep* (maize)	
Town,	*musipuo,*	*cee* (place), *sui* (to dwell), *sicona pues* (to live).	
Night,	*kisi,*	*shki.*	
Thief,	*shisnugui,*	*nruošh*	
Morning,	*sik,*	*seök*	
When,	*pena,*		*ping*
Sweet,	*shiboh,*	*biuk.*	
To go,	*guateque,*	*ta took* (I go)	
It rains,	*oki man,*	*tskoki.*	
One,	*cari,*	*kraré.*	
Two,	*ra-bó,*	*bukk.*	

On looking over this list it is obvious that the Guatuso affinities are too slight to justify the assumption of a relationship. The syllable *cur* in the words for woman, and *shu* for mother, are the only elements that offer a real similarity, and this is too scanty a supply to work on

In the Costa Rican analogies the sense is often too remote. It is scarcely fair to consider "father" and "man" as identical ideas, or "child" and "little," "head" and "point," "meat" and "deer;" "salt" and "pepper;" "maize" and "cornfield," etc Selecting words so asunder in meaning and choosing, from several dialects on both sides, apparent analogies can always be found Other words present, in fact, no resemblance, as *sudi* to *sleep, druna* to *shimpue, i-ahu-wah* to *nitmip*, etc. There remain a few actual similarities which may be linguistic identities, but these should probably be explained by the fact that the Timote tribes lived near those of Chibcha lineage, and doubtless borrowed from them a number of terms. Such loan words are found in the tongues of all nations who reside in close proximity for a few generations.

I conclude, therefore, that the Timote must still be regarded as an independent stock, and its connection with any in North America has not yet been demonstrated.

On crossing the mountain chain which separates Costa Rica

from Nicaragua, we enter a territory which was at the discovery occupied by nations whose traditions and linguistic affinities pointed to the higher latitudes of North America. Such was the Nahuatl tribe, who occupied the islands and southern shores of Lake Nicaragua, and the Mangues, who peopled the borders of Lake Managua.

The latter were closely related to the Chapanecs of Chiapas, speaking the same tongue with slight dialectic variations. One band of the Mangues, about four hundred in number, was found by the early explorers among the Guaymis, one of the Costa Rican tribes whose language has marked affinities to the Chibcha idioms of New Granada. The close relations thus established between the two stocks reappear in the Mazatec language, spoken in the district of Teutitlan del Camino, State of Oaxaca.

Availing myself of a MS. vocabulary of this language, furnished me by M A. Pinart, I have shown that it is essentially a Chapanecan dialect, but with a strong infusion of Costa Rican, and especially Guaymi, elements, and presents the most northern example of the influence of South American upon North American languages.* The following examples will illustrate the similarity·

	Mazatec.	Costa Rican
Sun,	*tsui,*	*chuí* or *sua.*
Moon,	*sa,*	*só, sia* (or *sa*)
Ear,	*sohteal,*	*guhgea, sohuke.*
Eye,	*schou,*	*s'bovo, boua.*
Hair,	*coahá,*	*sohá, quyhé*
Man,	*ohí,*	*ha-ohí-che.*
Woman,	*chu,*	*siu, gñi.*
Rain,	*tsi,*	*siu.*
Sea,	*daohicu,*	*decheque-sa.*
Foot,	*tsoco,* .	*tsuku*
Head,	*tku,*	*bokua.*
Nose,	*nito,*	*nido-ã.*

The Mazatecs were a people of considerable culture, celebrated for their religious fervor, and for the important temples and sanctuaries established in their country, prominent remains of which still exist.

* See a paper by me in the *Proceedings of the American Philosophical Society*, January, 1886, entitled "The Mazatec Language and its Affinities."

X.

ON THE DIALECTS OF THE BETOYAS AND TUCANOS.

The most recent writer on the Tucanos of the Rio Negro and Upper Amazon, Dr Franz Pfaff, observes: "Ueber die Stammesverwandtschaft der Tucanos kann mit einiger Sicherheit nichts behauptet werden" * Von Martius believed them a horde of the Tapuya (Gês, Botocudo) stock; † but their language betrays no such relationship except in a few, doubtless borrowed, words. They are equally far from the great Tupi, Arawack and Carib stocks. But I believe I can show by conclusive evidence that this hitherto unidentified people speak a language akin to that of the Betoyas and Tamas, whose home is located on the eastern slope of the Cordillera, between the head waters of the rivers Apure and Meta.

My further studies of the Betoya dialects have resulted in discovering for them a much wider extension than I assigned in *The American Race* They can be traced through about ten degrees of latitude (from 3° South latitude northeastward to 7° North latitude) in a large number of tribes resident on the rivers Napo, Putumayo, Caqueta, Uaupes, Negro, Meta and Apure. The affinities of many of these tribes are asserted by the early missionaries, whose testimony on such points was based on a study of the languages. One of the most useful of these sources is the *Noticias Autenticas del Famoso Rio Marañon*, composed by an anonymous Jesuit missionary, and recently published for the first time under the competent editorship of Jimenez de la Espada by the Geographical Society of Madrid

Another Jesuit, Father Padilla, in a letter to the Abbé Hervas, stated from personal knowledge that the *Sirarus*, *Eles*, *Airicos* and *Situjas* all speak dialects of Betoya, while Gumilla names as other dialects the *Lucuha*, *Jabua*, *Arauca* (probably for *Airica*), *Quilifay*, *Anabali*, *Lelaca* and *Ataboca*.

The town *Betoye* itself is situated on a small affluent of the Casanare, in 6° North latitude, at the foot of the mountain chain known as the "Paramo de Chisga," inhabited by a wild tribe of unknown affinities, the *Chitareros*.

The anonymous writer already referred to states that in 1730 the Jesuits had seven "reductions" among the Icaguates (Piojes) of

* *Verhandlungen der Berliner Gesell. für Anthrop.*, etc., [illegible], s. [illegible].
† *Glossaria Linguarum Brasiliensium*, p. [illegible].

the Napo, and their missions extended north to the banks of the Putumayo, on which stream were the *Amaguages* and the *Oceguages*. Below the latter, and occupying most of the district between the middle Putumayo on the north and the lower Napo and Amazon on the south, were a number of tribes collectively called *Zeonas* (*Seones*), comprising the *Cungies*, *Parianas*, *Concegauges* and others. These spoke a tongue allied to that of the Icahuates (Piojes); while "the *Neguas*, *Senses*, *Tamas*, *Acunejos* and *Atuaras* are all of one tongue " The editor, Jimenez de la Espada, speaking from personal knowledge gained on the spot, identifies the modern Piojes with the *Encabellados* of the Spanish writers and the *Icaguates* of the Jesuits.

It is greatly to be regretted that the ample material existing in manuscript for the study of the Zeona language has not been made accessible Col. Joaquin Acosta had in his library a *Diccionario y Doctrina en lengua Zeona* of 416 pages and another MS of 116 pages. He expected to present them to the public library of Bogota, but I have not been able to ascertain whether they are there.

From these materials I present the following list of tribes who should be classed in this linguistic family·

The Betoya Linguistic Stock.

Acaneies, a branch of the *Tamas*.
Aguaricos, a branch of the *Tamas*.
Airicos (Ayricos), adjoin *Betoyes* to the south
Amaguages, on upper Caqueta.
Anibalis, on Rio Apure.
Atuaras, a branch of the *Tamas*.
Avijiras, on Rio Napo.
Bernarias, a branch of the *Icaguates*.
Betoyes, on and near R. Casanare
Concaguages, on upper Putumayo south of the *Correguages*
Ceonas = *Zeonas*.
Cobeus, north of the *Tucanos*.
Correguages, on head waters of Caqueta and Putumayo.
Cungies (Kengeioios), on R. Cungies, a branch of R. Putumayo.
Curetus (Coretus), west of the *Tucanos*.
Daci = *Tucanos*.
Eles, north of *Betoyes*, on Rio Casanare.
Encabellados = *Piojes*.
Icahuates (*Icaguates*, *Icaguages*), former name of *Piojes*.
Jamas, on Rio Manacacia.
Jounas, near River Uaupes.

Jupuas, on Rio Apaporis.
Lolacos, a branch of the *Betoyas*
Macaguages, on Rios Caucaya, Mecaya and Senseila
Maguacias, a branch of the *Icakuates*.
Malifilitos, a branch of the *Betoyas*
Naguas, a branch of the *Tamas*.
Ocoguages, on R. Putumayo, near R. Pineya
Pararies, a branch of the *Zeonas*.
Payaguas, a branch of the *Icakuates*
Poqueyas, a branch of the *Piojes*.
Piojes, on Rios Putumayo, Napo and Cocaya
Pousevaries, a branch of the *Icahuates*.
Quiifayes, on Rio Apure
Seisos, a branch of the *Tamas*
Seonas = *Zeonas*.
Sitiufas (or *Situjas*), on Rio Casanare
Tamas, on Rio Yari and R. Cagua.
Tucanos, on the Rio Uaupes.
Uaupes, on R. Uaupes.
Yaguas, a branch of the *Piojes*
Yahobos, a branch of the *Icakuates*.
Yetes, a branch of the *Piojes*.
Zenseies, a branch of the *Zeonas*
Zeonas, between lower Napo and Putumayo rivers.

Several of these names are synonyms, or merely the same word with varying orthography. The specific termination of *nomina gentilia* in the Betoya dialects would seem to be *guage*, which is perhaps the *guee*, house, household, people, of the Correguage. Thus, *Oco-guage* = water people, this tribe, according to Markham, being remarkably skillful canoemen. *Yete* is the Corr. for "hands." "*Pioje*" is the negative "no," with which these natives reply to all inquiries addressed them by travelers. Other of the names belong to the Lingoa Geral; as, *Payagua* = enemies, *Pararie* (*para-uara*), parti-colored, *i. e.*, painted men, *Atuara* = the basket (making) men; *Jupua* in the Jauna dialect means "tree" or "wood" men, while *Jauna* means, in the *lingoa geral*, "water-men." *Dacé* is the name of the Toucan bird in the Tucano dialect. "Curetu" in the *lingoa geral* is an opprobrious epithet, "rascals." It was applied to several tribes. Balbi, in his *Atlas Ethnographique*, gives a short vocabulary of one of these "rascal" tribes, who lived at Ega on the Amazon. It has no connection with the Curetu of the Rio Apaporis.

The Jupua and Curetu dialects are properly one and the same, the difference which appears in their vocabularies arising simply from inequality in the ears and the orthographies of observers This is evident by the following comparison of the vocabularies of Martius (German orthography) and Wallace (English orthography):

	JUPUA (MARTIUS).	CURETU (WALLACE).
Blood,	*thik,*	*dū*
Bow,	*patopai,*	*patuaipai*
Earth,	*thitta,*	*ditta*
Flesh,	*ga'hō',*	*se'hea'*
Finger,	*moh asoing,*	*mu-siahu.*
Fire,	*piori,*	*piure*
Flower,	*pagari,*	*bagarua.*
Foot,	*gŏapha,*	*giapa.*
Hair,	*poa,*	*phoa.*
Hand,	*moho,*	*muhu.*
Head,	*co'ēre,*	*cuilri.*
House,	*wu'i,*	*wee*
Mouth,	*thischüh,*	*dishu.*
Sun,	*hausă,*	*aoui*
Tongue,	*tōro,*	*dolo*
Tooth,	*gobăckaa',*	*gophpeouh.*
Water,	*thâso,*	*dooe*
Woman,	*nomba,*	*nomi.*

These two, the Jupua and Curetu, together with the Jauna and Cobeu, form with the Tucano a group of dialects closely related among themselves; and they are a branch of the same mother tongue as the Betoya, Tama, Pioje and Correguage, which, in turn, present also merely dialectic differences between each other.*

In spite of the imperfect materials yet available to study this extended family, the relationship of its scattered members is demonstrable. To illustrate it, I submit the following.

Comparative Vocabulary of the Betoya and Tucano Dialectic Groups.

Betoya Group: B. = Betoi; C. = Correguage; P. = Pioje, T. = Tama.
Tucano Group: Cob. = Cobeu; Cur. = Curetu; Jup. = Jupua; Tuc. = Tucano.

* Dr Pfaff (u. s. p. 602) has compared five words of the Tucano, Coretu and Cobeu, presenting similarities; and Dr. Ernst (*Zeitschrift für Ethnol.*, 1891) has shown similarities of six words in Tamas and Tucano; but a general survey of the stock has not heretofore been offered.

Man,	*umasoi*, B., *emiud*, C.,	*eume*, *imea*, Tuc.; *ermeu*, Cob., Cur.
Woman,	*domi*, C.; *romeo*, T.,	*nomi*, Cur.; *nomio*, Tuc.
Fire,	*te'a*, P., T., *fu-tui*, B.;	*toua*, Cob.
Water,	*oco*, B., C., P., T.,	*oco*, Tuc.; *hóggea*, Jup.
Rain,	*oco-raime*, C.,	*oco-ro*, Tuc.
Tongue,	*chimenu*, P.;	*chemeno*, Tuc., *erimende*, Cob.
Hand,	*r'umocoso* (my hand),	*umoca*, Tuc.
Foot,	*coapi*, C.,	*goaphas*, Jup., *giapo*, Cur.
Teeth,	*cofini*, C.,	*coping*, Cob.
Nose,	*ʃinkepiu* (thy), C.,	*enkonka*, Tuc.
Forehead,	*siapuo*, C., *jopue*, T.,	*dipua*, *righpoah* (head), Tuc.
Breast (mamma),	*oχecho*, C.,	*oχ-penne*, Tuc.
Meat,	*guai*, C.,	*ga'hi*, Jup.
Maize,	*huka*, P.,	*o-hoka*, Tuc.
Jaguar,	*ta'i*, P., *chai*, C.;	*jih*, Jup.
Parrot,	*gueco*, C.,	*waχki*, Tuc.
Deer,	*ñama*, C.,	*ñama*, Jup.
Egg,	*tela*, C.;	*dia*, Cur.
Fowl,	*cura*, C.,	*caru hia*, Cob.
Monkey,	*tangue*, C.;	*aχke*, Tuc.
Stone,	*rala*, C.;	*iχtana* (= *i cata-na*), Tuc.
Star,	*manioco*, C.,	*jochoo'*, Jup., *ambiogowa*, Cur., *ua'coa*, Tuc.
Banana,	*ohoh*, P., C.;	*ohoh*, Tuc.
Son,	*sii*, C.;	*si mugi*, Cur.
Sky,	*quen-ome*, C.,	*imina*, J., *imi-se*, Tuc.
Canoe,	*chogue*, C.,	*yuki*, Tuc.
Devil,	*guaih*, C.;	*euatin*, Tuc.
Enemy,	*pai name*, C.;	*ua-pai*, Tuc.
Farewell,	*sayé*, P.,	*uáyé*, Tuc.

In other words, although the identity of the radicals exists, it is not visible in the forms presented. Thus, in Wallace's vocabulary both "sun" and "moon" are rendered by *uipo*, which is the Betoya *ubo*, sky, heaven.

Domi, *nomio*, "woman," is really a compound of the Betoya feminine *ro*, female, and *emu*, or *uma*, "man" (homo), as is easily seen in the Tama *ro meo*.

Very few analogies are visible to the Tapuya (Gês) dialects, to which the Tucano has usually been assigned. The only one of importance is the word for fire, *pekhámi* (Tuc.), *pikgù* (Jauna), which appears to be the Botocudo *pÿk*.

The conception of number is very slightly developed in this stock, and even the dialects most closely related show wide variations; for example:

	Betoya.	Tama.	Piojé.
1,	*edoyoyoi*,	*teyo*,	*meño* (finger)
2,	*edoi*,	*ca'yapa*.	*tsamun-cua*
3,	*ibutu*,	*cho-teyo* (2+1).	*tsamun huenle-cua*
4.	*ibutu-edoyoyoi* (3 + 1).	*ca'yapa-ria* (2 again),	*tajcerra*
5,	*ru-mocoso* (hand),	*cia-jente* (hand),	*tenerapia*.

In the vocabularies both *moko* and *jente* (*jete*) are given for hand, and both are used in the words for "five."

In the Tucano group the dialect which has retained the strongest affinities is the Curetu:

	Curetu
One,	*tohudyu* (= Betoya *édyoyu*).
Two,	*ap-adyu* (= " *édyu*).
Three,	*areyu*.
Four,	*apoadyái* (= 2 + 2)
Five,	*tohumupa*

I believe the evidence here briefly presented will be adequate to prove the extended affinities of this stock, and to vindicate its importance in South American ethnography. How far its analogies may be traced north and west I have not sufficient materials to determine. In *The American Race*, p. 275, I pointed out a few similarities between Betoya and Choco roots, and I would particularly mention that the words for "man" and "woman," *uma* and *ira*, reported by early explorers (in 1515) as in use along the northern shore of Venezuela and the Isthmus of Panama, certainly belong to the Betoya language.*

* "En toda esta tierra llaman á los hombres umas, y á las mugeres iras." See J. Acosta, *Historia de Nueva Granada*, p. 458. The tract referred to is from the Gulf of Uraba to the Punto del Nombre de Dios, along the shore of the Isthmus of Panama.

Stated Meeting, January 15, 1892.

Present, 47 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

A circular from the Observatoire National Astronomique et Météorologique d'Athènes, asking exchanges, which was agreed to.

A circular from M Julio N. Rosas, announcing his appointment as Director Général de Statistique de la Province de Buenos Aires, La Plata

A circular from the Royal Geographical Society, on the orthography of geographical names.

Letters of envoy from the Observatory, Adelaide, S. Australia; Biblioteca N. C. di Firenze, Musée Guimet, Paris; Meteorological Office, Zoölogical Society, London, Eng.

Letters of acknowledgment from the Royal Geographical Society of Australasia, Melbourne, Victoria (131–134); Tokyo Library (135), Prof. Dr. Ludwig Rütimeyer, Basel, Switzerland (135), Direccion General de Estadistica de la Provincia de Buenos Aires, La Plata (131, 132, 133, 134).

Accessions to the Library were reported from the Observatory, Adelaide, Australia; Count R. d'Hulst, Alexandria, Egypt; Anthropological Society, Tokyo; Société Imp des Naturalistes, Moscow; Physical Central-Observatoriums, Bibliotheque Geologique de la Russie, St. Petersburg; Académie R. de Belgique, Bruxelles; K. Nordiske Oldskrift Selskab, Copenhagen; Physiologische Gesellschaft, Berlin; R. Ministero della Instruzione Publica, Firenze; R. Istituto Lombardo, Milan, Société des Antiquaires de Picardie, Amiens, France; Société Historique, Littéraire, etc., Du Cher, Bourges, Société de Borda, Dax; Société des Sciences Naturelles, etc., de la Creuse, Guéret, Société des Sciences Naturelles, La Rochelle; École des Mines, Musée Guimet, Société Zoologique de France, Société D'Anthropologie, Société N. des Antiquaires de France,

Paris; Société de Géographie, Toulouse; Académie N. des Sciences, etc., Bordeaux; Société des Antiquaires de la Morinie, Saint Omer; Zoölogical Society, London; Geological Society, Manchester; Natural History Society, Montreal; Historical and Scientific Society of Manitoba, Winnepeg; Harvard University, Cambridge, Mass.; Travelers' Insurance Co., Hartford, Conn.; Editors of the "American Journal of Science," Agricultural Experiment Station, New Haven, Conn; Agricultural Experiment Station, Storrs, Conn., Mathematical Society, New York; Engineers' Club, College of Pharmacy, Franklin Institute, Hydrographic Office, Dr. Charles A. Oliver, Philadelphia, State Board of Health, Nashville; Experiment Station of Florida, Lake City, Editor of "Journal of Comparative Neurology," Cincinnati, O; Sociedad Cientifica "Antonio Alzate," Mexico.

The decease of the following members was announced

General Montgomery C Meigs, Washington, D. C.; born May 3, 1816; died January 2, 1892.

Mr. Addison May, West Chester, Pa.; died January 8, 1892, æt. 80.

Mr Edward Penington, Philadelphia; died December, 1891.

Prof. Jean Louis Armand de Quatrefages, at Paris, January 12, 1892, æt. 82

This being the evening for the selection of the Standing Committees of the Society, for the ensuing year, on motion the President was authorized to appoint the same, which he subsequently did as follows.

Finance.

William B. Rogers, Philip C. Garrett, Charles S. Wurts.

Hall.

J. Sergeant Price, William A. Ingham, Charles A. Oliver.

Publication.

Daniel G. Brinton, George H. Horn, Samuel Wagner, Patterson Du Bois, Horace Jayne.

Library.

Edwin J Houston, William John Potts, Jesse Y. Burk,
William H. Greene, William S. Baker.

Michaux Legacy.

Thomas Meehan, J. Sergeant Price, William M. Tilghman,
Isaac Burk, Isaac C. Martindale.

Henry M Phillips' Prize Essay Fund.

Richard Vaux, Henry Phillips, Jr, William V. McKean,
Furman Sheppard, Joseph C Fraley,
The President and the Treasurer of the Society, *ex officio*

This being the evening for the election of Librarian, a ballot was held and the tellers reported that Mr Henry Phillips, Jr., had received 28 votes and Mr. Benjamin Smith Lyman had received 12 votes, whereupon Mr. Phillips was declared duly elected Librarian for the ensuing year.

[Secretary Phillips present and not voting]

Pending nominations Nos. 1232 and 1233, and new nominations Nos. 1234, 1235, 1236, 1237, 1238, 1239 and 1240 were read.

The Committee appointed to examine the paper of Prof. Cope, offered at the last meeting for the Transactions, reported progress and was continued.

Dr Brinton presented the following papers for the Proceedings· "On the Mazatecan Language of Mexico, and its Affinities," and "Observations on the Chinantec Language of Mexico"

The Committee on the Michaux Legacy presented a paper on "The Temperate and Alpine Floras of the Giant Volcanoes of Mexico," by Prof. Angelo Heilprin, which was ordered to be printed as a part of its report.

The report of the Committee, on the Publications of the Society, appointed December, 1890, was then taken up.

The report was then read, signed by the Chairman and three

other members of the Committee, the Chairman stating in answer to inquiry that the signature of the other member was withheld on account of his not approving the second resolution. The resolutions were then read as follows.

Resolved, 1 That the Proceedings of the American Philosophical Society be issued quarterly, and also at more frequent periods whenever an amount of matter is ready for press, which will make sixty four pages of text, but so as not to interfere with the regularity of the quarterly issue.

Resolved, 2. That in order to permit estimates of the cost of illustrations, authors shall submit either completed drawings or the specimens to be drawn; and that the Secretaries shall accept either as sufficient basis for the publication of articles otherwise unobjectionable.

On motion of Dr. Frazer, the Society proceeded to the consideration of report of the first resolution A debate took place thereon, participated in by Messrs. Price, Morris, Houston, Cope, Frazer, Barker, Vaux, Martindale and Horn.

Mr. Martindale moved to strike out all after the word "quarterly" and to insert thereafter the words "provided sufficient material shall be furnished for that purpose."

The amendment being put to a vote was carried and a vote being taken on the resolution as amended it was adopted.

The question then arising on the adoption of the second resolution, Dr. Brinton stated his reasons for declining to recommend the same, and offered as an amendment the substitution of the word "may" for "shall" in the third line, to read "the Secretaries may, etc."

The amendment was carried and the resolution as amended was adopted.

On motion of Mr. Dudley, the Society adjourned.

Stated Meeting, February 5, 1892.

Present, 8 members.

Dr. MORRIS in the Chair.

The following correspondence was submitted:

A letter from Commander F M Green, U. S A, giving sufficient reasons for declining the membership in the Society to which he had been elected.

A circular from the Manchester Geographical Society, announcing the decease of its President, the Duke of Devonshire.

A letter from Gustav Fock, bookseller in Leipzig, offering for sale the library of the late Prof. Zarnke for 45,000 marks.

Accessions to the Library were announced from the Royal Society of South Australia, Prof H. Y. L. Brown, Adelaide; Linnean Society of N. S. Wales, Sydney, Prof. H. H. Risley, Calcutta; Section für Naturkunde O. T. C., Vienna; K. danske Geografiske Selskab, Copenhagen; Gesellschaft für Erdkunde, Deutsche Geologische Gesellschaft, Horticultur-Gesellschaft, Messrs. Friedlander & Sons, Berlin; K Sächsische Meteorologische Institut, Chemnitz; Société des Sciences Naturelles, Fribourg; Verein für Erdkunde, Halle a. S.; Verein für Thuringische Geschichte und Altertumskunde, Jena; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; K. B. Akademie der Wissenschaften, Munich; R. Societatas Scientiarum, Upsal; État Indépendant du Congo, Bruxelles; Société Vaudoise des Sciences Naturelles, Lausanne; Société de Géographie, Lille; Université de Lyon, Société de L'Enseignement Supérieur, Marquis de Nadaillac, Paris; R. Academia de la Historia, R. Academia de Ciencias, etc., Madrid; Meteorological Council, R. Statistical Society, Society of Arts, Royal Society, Editors of the "Geological Magazine," Mr. Frederick Arthur Crisp, London; Agricultural Experiment Stations at Bangor, Me., Amherst, Mass, Kingston, R. I., Auburn, Ala., College Station, Tex, Corvallis, Oreg., Laramie, Wyo, National Civil Service Reform League, Boston;

Hon. Robert C Winthrop, Prof. Eben Norton Horsford, Harvard University, Cambridge; Essex Institute, Salem; Brown University, Providence, R. I.; Prof. E. North, Clinton, N. Y; Free Public Library, Jersey City, Bureau of Statistics of New Jersey, Trenton; American Pharmaceutical Association, Drexel Institute, Drs. J. E. Ives, D. Jayne, J. C. Ayer, Mr. Henry Phillips, Jr., Philadelphia; American Chemical Society, Baltimore; Anthropological Society, Bureau of Navigation, Mr. Lester F. Ward, Washington, D. C.; Oberlin College, Oberlin, O.; Colorado Scientific Society, Denver, Observatoire Météorologique Central, Observatorio Astronómico Nacional de Tacubaya, Mexico; Observatorio Nacional Argentino, Buenos Aires; Museo de La Plata, Prof. Ladisláu Netto, Rio de Janeiro.

The Committee on Dr. Cope's Paper for the Transactions reported the same to be worthy of publication and was discharged.

Photographs of the following members were presented for the Society's Album:

Dr. Thomas Chase, Providence, R. I.

Dr. J L. Campbell, Crawfordsville, Ind

Dr. W. G. A. Bonwill, Philadelphia.

Mr. Charles Truscott presented a photograph from the portrait of Franklin owned by the Society.

Miss Emily Phillips presented a locket containing hair of General Andrew Jackson

The following announcements of the deaths of members were made:

Paul Hunfalvy, Budapesth, December, 1891.

Andrew C. Ramsay, London, December, 1891.

Thomas Jefferson Lee, Baltimore, December, 1891.

Rev. Joseph F. Garrison, Camden, N J, January, 1892, æt. 70.

The President appointed Mr. William John Potts to prepare the obituary notice of Dr. Garrison.

Prof. Cope offered for the Transactions a paper by himself on "The Homologies of the Posterior Cranial Arches in the

Reptilia," which was referred to a Committee to be appointed by the President.*

Dr. Cope offered for the Proceedings "A Contribution to the Vertebrate Palæontology of Texas."

Dr Brinton presented for the Proceedings "Studies in the South American Native Languages," which was ordered to be printed.

The paper by Dr. Bonwill, "Geometry and Mechanics Deny Evolution," was made the special order for March 4, 1892.

Pending nominations 1232 to 1240 (inclusive) were read.

On motion of Dr. Brinton, it was resolved that a Committee of three should be appointed by the President to consider the advisability of taking concerted action in connection with other learned societies for the celebration of the four-hundredth anniversary of the discovery of America. †

And the Society was adjourned.

Stated Meeting, February 19, 1892.

Present, 12 members.

President, Mr. FRALEY, in the Chair

Correspondence was submitted as follows:

Acknowledgments (186) were received from the Geological Survey, Ottawa; Canadian Institute, Toronto; N. S. Institute of Science, Halifax; Society of Natural History, Maine Historical Society, Portland, Me.; Agricultural Experiment Station, Amherst; Prof C. H. Hitchcock, Hanover, N. H.; Vermont Historical Society, Montpelier; State Library of Massachusetts, Historical Society, Boston Public Library, Society of Natural History, Mr. Robert C. Winthrop, Boston;

* The President subsequently appointed as such Committee, Drs. Ryder, Jayne and Sharp.

† The President subsequently appointed as such Committee, Drs. Brinton, Cope and Fraser.

Museum of Comparative Zoölogy, Profs. A. Agassiz, Charles W. Eliot, Robert N. Toppan, Cambridge, Mass.; Dr. Pliny Earle, Northampton, Mass.; Essex Institute, Salem; American Antiquarian Society, Worcester, Brown University, R. I. Historical Society, Providence; Mr. George F. Dunning, Farmington, Conn.; Historical Society, Theological Seminary, Hartford; Yale University, N H Colony Historical Society, Profs. O. C. Marsh, H. A. Newton, W D. Whitney, New Haven; Prof. James Hall, Albany; Society of Natural Sciences, Buffalo Library, Buffalo, N. Y.; Prof. E. North, Clinton, N. Y., Profs. J. M. Hart, J. E Oliver, Ithaca, N. Y.; American Museum of Natural History, Mathematical Society, Meteorological Observatory, New York Historical Society, Hospital Library, University of the City of New York, General Henry L. Abbot, Mr. Joel A. Allen, Prof. J J. Stevenson, New York; Vassar Brothers Institute, Poughkeepsie; Oneida Historical Society, Utica, U. S. Military Academy, West Point; Prof. Henry M. Baird, Yonkers, Mr Isaac O. Martindale, Camden, N. J, Profs. W. H. Green, C. A. Young, Princeton; Dr. Robert H Allison, Ardmore, Pa.; Mr. Burnet Landreth, Bristol; Prof. Robert W Rogers, Carlisle; Prof. Martin H. Boyè, Coopersburg, Hon. Eckley B Coxe, Drifton, Rev. Thomas C. Porter, Prof. J. W. Moore, Dr. Traill Green, Easton; Prof Lyman B. Hall, Haverford College P. O.; Mr. Ario Pardee, Hazleton; Mr. John Fulton, Johnstown; Academy of Natural Sciences, Engineers' Club, Wagner Free Institute, Numismatic and Antiquarian Society, Philadelphia Library, Drs. W. G. A. Bonwill, H. C. Chapman, George Friebis, W. W. Keene, George R. Morehouse, Isaac Norris, Charles A. Oliver, C. N. Peirce, W. S. W. Ruschenberger, H. Clay Trumbull, Profs. John Ashhurst, Jr., F. A. Genth, Jr., H. D. Gregory, J. P. Lesley, John Marshall, Samuel P. Sadtler, H. W Spangler, Messrs. Henry Carey Baird, William S. Baker S. Castner, Jr, Thomas M. Cleemann, Patterson Du Bois, J S Harris, William A. Ingham, W. W. Jefferis, G de B. Keim, James T. Mitchell, C. Stuart Patterson, Henry Phillips, Jr.,

Franklin Platt, Theodore D. Rand, Samuel Wagner, Talcott Williams, Admiral E. Y. Macauley, Philadelphia; Mr. Heber S. Thompson, Pottsville; Rev. G. W. Anderson, Rosemont, Pa.; Philosophical Society, Messrs. William Butler, Philip P. Sharpless, W. Townsend, West Chester, Maryland Institute, Baltimore, Agricultural Experiment Station, College Park; Leander McCormick Observatory, University of Virginia, Prof. J. W. Mallet, Charlottesville, Va.; Agricultural Experiment Station, Prof. I. C. White, Morgantown, W. Va.; N. C. Agricultural Experiment Station, Raleigh; University of Alabama, University P. O., Agricultural Experiment Station, College Station, Tex.; Prof. E. W. Claypole, Akron, O., Cincinnati Observatory; Editor of the "Journal of Comp. Neurology," Granville, O.; Columbia Athenæum, Tenn.; Prof. J. L. Campbell, Crawfordsville, Ind., Experiment Station, La Fayette, Ind.; Historical Society, Chicago, Academy of Science, St. Louis; Geological Survey of Missouri, Jefferson City, General William F. Reynolds, Detroit, Mich., Kansas Academy of Science, Topeka; State Historical Society, Madison, Wis.; University of California, Berkeley; Prof. George Davidson, San Francisco, Cal.

Letters of acknowledgment were received from the Tokyo Anthropological Society (135); Société de Geographie, Bucarest, Roumania (135); University Library, St. Petersburg (135); Société de Géographie de Finlande, Helsingfors (131–135); Société R. des Sciences, Upsal, Sweden (134); Maatschappij de Nederlandsche Letterkunde, Leiden (135), Société Neuchateloise de Geographie, Neuchatel (135); Redaction der "Naturwissenschaftlichen Wochenschrift," Berlin (135); Naturforschende Gesellschaft in Emden (135), Oberhess. Gesellschaft f. Natur. u. Heilkunde, Giessen; M. Otto Bohtlingk, Leipzig (135); Société des Sciences Naturelles, etc., Guéret, France (135); Prof. Léon de Rosny, Paris (134, 135); Société des Antiquaires de la Morinie, St. Omer (131–134); R. Istituto di Studi Superiori, Florence, Italy (135); Bowdoin College, Brunswick, Me. (96–130, 132–135, and Catalogue, Parts i–iv), Mr. George F. Dunning, Farmington, Conn. (135);

Free Public Library, Jersey City (96–130, 136, and Catalogue, Parts i–iv).

Letters of envoy were received from the Société de Géographie de Finlande, Societas pro Fauna et Flora Fennica, Helsingfors; Naturwissenschaftliche Verein für Schleswig-Holstein, Kiel, Prussia; K. Sächsische Gesellschaft der Wissenschaften, Leipzig, Société Royale des Sciences, Upsal, Sweden; R. Academia de Ciencias y Artes, Barcelona, Spain; Royal Statistical Society, Lowdon, Boudoin College, Brunswick, Me, Messrs. J. C Ayer & Co., Lowell, Mass.; Observatoire Météorologique Central de Mexico.

Accessions to the Library were reported from the Geological Survey of India, Calcutta; Magyar Tudományos Akadémia, Société Hongroise de Géographie, Budapesth, Société de Geographie de Finlande, Societas pro Fauna et Flora Fennica, Helsingfors, Société Royale de Geographie, Antwerp, Gesellschaft für Anthropologie, Ethnologie, etc, Berlin, Naturwissenschaftlicher Verein für Schleswig-Holstein, Kiel, Publishers of the "Revue Universitaire," Paris; R. Academia de Ciencias y Artes, Barcelona, Spain; Royal Society, Royal Geological Society, London, Royal Society, Edinburgh; Philosophical Society, Cambridge, Eng., Bowdoin College, Brunswick, Me., Harvard College, Cambridge, Mass., Prof. William Dwight Whitney, New Haven, Astor Library, Academy of Sciences, American Museum of Natural History, Dr. T. Sterry Hunt, New York; Hon Thomas H Dudley, Camden; Mr Albert S Gatschet, Washington, D C., Public Library, Cincinnati; State Historical Society, Iowa City; Wyoming Agricultural College, Laramie, Missouri Geological Survey, Jefferson City; Dr John C. Branner, Little Rock, Ark., Academy of Science, Tacoma, Wash; Prof. J. de Mendizábel Tamborrel, Mexico.

The Committee appointed at last meeting to examine Prof. Cope's paper for the Transactions, reported it worthy of publication, and was discharged.

The deaths of Theodore Mommsen (February 3, 1892, æt. 75) and T. Sterry Hunt (February 12, 1892, æt. 66) were announced.

On motion, the Society appointed Mr James Douglass, of New York city, to prepare the usual obituary notice of Dr. Hunt.

The proceedings of the Board of Officers and Council were submitted.

This being the stated evening for balloting for candidates for membership, pending nominations Nos. 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239 and 1240 were read, spoken to and voted upon.

Prof. Cope made an oral communication on "The Geology of the Staked Plains of Texas."

The Committee on Extended Accommodations presented a final report, and stated that the total cost of alterations to the building had amounted to $41,449 72.

On motion of Dr. Brinton, the report was accepted and the Committee discharged, with the hearty thanks of the Society for its long, arduous and faithful labors.

The Library Committee reported the following minute:

STATED MEETING, FEBRUARY 12, 1893.

The Librarian reported that owing to the advanced condition of the Library he had been able to dispense with the services of the assistants hitherto employed by the Committee, and pursuant to authority granted him by the Chairman he had discharged them.

The action of the Librarian was approved.

The Librarian was directed to purchase the New Century Dictionary, the Supplement to Allibone's Dictionary, and U S. wall map.

Dr. Morris, on behalf of the Curators, reported that the Peale collection of relics of the Stone Age had been placed in the Society's museum, and that all expenses connected with the transfer of the same had been borne by Mr. Robert Patterson, to whom the thanks of the Society were tendered.

The thanks of the Society were tendered to Miss Emily Phillips for a gift of a locket containing the hair of General Andrew Jackson, presented at the last meeting of the Society.

All other business having been transacted, the tellers reported to the President the result of the ballot, who thereupon

declared the following to have been duly elected members of the Society:

2199. Hon. George William Curtis, New York city, N. Y.

2200. Anthony J. Drexel, Esq., Philadelphia.

2201. Prof. Edward A. Leech, Ph.D., Director U. S. Mint, Washington, D. C.

2202. Hon. Seth Low, LL.D., President Columbia College, New York city, N. Y.

Dr. E. D Cope offered the following amendment to Chapter ix, Section 1, of the Laws:

The ordinary meetings of the Society shall be on the first and third Fridays of every month, from September to the third Friday in June inclusive, at eight o'clock in the evening.

And the Society was adjourned by the President.

Stated Meeting, March 4, 1893.

Present, 27 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Acceptances of membership were read as follows:

Mr. Anthony J Drexel, Philadelphia

Hon. Seth Low, New York city, N Y.

Hon. George William Curtis, West New Brighton, Staten Island, N. Y.

A circular was received from the Linnean Society of New South Wales, announcing the death of its President, Sir William Macleay.

A letter from P. Steiner (Darmstadt) in reference to his language, *Pasilingua.*

Letters of acknowledgment were received from the Institut

Egyptien, Cairo (185); Académie R. Danoise des Sciences, etc., Copenhagen (185); K. Bibliothek, Berlin (185); Deutsche Seewarte, Hamburg (185); Verein für Erdkunde, Netz (185); R. Accademia di Scienze, etc., Padova (185); Natural History Society, Montreal (186); Mr. Hamilton A. Hill, Boston (186), Free Public Library, New Bedford, Mass. (186), Prof. Burt G. Wilder, Ithaca, N. Y (186); American Museum of Natural History, New York city (97, 99, 100, 101, 127–185); New Jersey Historical Society, Newark (186); Messrs. Cadwalader Biddle, Samuel Dickson, Philadelphia (186); Maryland Historical Society, Baltimore (186), U S. Naval Observatory, U. S. Coast and Geodetic Survey, Anthropological Society, Patent Office, War Department (186), Department of Agriculture (186), Dr. W. J. Hoffman, Rt. Rev. J. J Keane, Capt. Thomas Jefferson Lee, Messrs. Charles A Schott, William B. Taylor, Washington, D. C. (186), University of Tennessee, Knoxville (186), Georgia Historical Society, Savannah (186), University of Cincinnati (99–180, and Catalogue, Parts i–iv), Colonel William Ludlow, Detroit, Mich (186), Indiana Society of Civil Engineers, Remington (186); Lick Observatory, Mount Hamilton, Cal. (96–180, 186, and Catalogue, Parts i–iv); Sociedad Cientifica "Antonio Alzate," Mexico (186), Academy of Science, Tacoma, Wash (96–180, 186. and Catalogue, Parts i–iv), Wyoming University Experiment Station, Laramie (186).

Accessions to the Library were reported from the K. N. F Universitetet, Christiania, Norway; Statistika Central Byrån, Stockholm, Sweden; Académie R Danoise des Sciences, etc., Copenhagen; Prof P. Steiner, Darmstadt, Germany, Prof. Léon Douay, Nice, France; Academy of Arts, San Fernando, Spain; Société de Geographie, Lisbon, Portugal; Sir J. D. Hooker, London, Eng.; Theological Seminary, Andover, Mass.; Harvard College, Cambridge, Mass , John M. Berry, Worcester, Mass., Rochester Academy of Science; Free Public Library, Jersey City; Mr. W. J. Potts, Camden, Historical Society of Pennsylvania, Academy of Natural Sciences, Dr. Persifor Fraser, Messrs. MacCalla & Co., Dr.

Charles A. Oliver, Philadelphia; U. S. Naval Observatory, War Department, Treasury Department, Washington, D C.; Agricultural Experiment Stations, Virginia, Mississippi, Arkansas; Denison University, Granville, O.; State Historical Society of Wisconsin.

The amendment to the Laws of the Society (Chap. IX, § 1) came up for action. Due proof of advertisement and notice of same having been first submitted, and a constitutional quorum being present, the Society then proceeded to consider the same.

Dr. Cope moved that it be adopted.

Mr. Vaux moved as an amendment that it be indefinitely postponed.

A vote being taken, Mr. Vaux's motion was carried, and the consideration of the amendment was indefinitely postponed.

The Publication Committee reported that the papers by Dr. Cope had been placed in the printers' hands, and that the illustrations to accompany them had been ordered to be prepared, and that Vol XVII, Part i, had been ordered to be closed and distributed when printed.

Dr. Bonwill read a paper entitled "Geometry and Mechanics Deny Evolution," which he illustrated with diagrams and specimens.

Dr Cope spoke against some of the propositions set forth by Dr. Bonwill, and exhibited specimens of early dentition from Spuj, Belgium.

Dr. Cope offered for the Proceedings a paper on "Tiaporus, a New Genus of Teiidæ."

Mr. Price, Chairman of the Hall Committee, presented the following report:

To the American Philosophical Society:

The Hall Committee respectfully reports that they have carefully considered the matter of a fireproof in the new building to preserve the valuable books, papers and documents belonging to the Society, which was referred by it to them They have called in consultation with them Messrs. Wilson & Bros., the architects of the building, who have prepared detailed drawings for the construction of a fireproof 4 feet by 14 feet in

the clear inside and reaching from the floor to the ceiling, and situate in the southeast corner of the northern room on second floor, which will afford ample room for many years to come for the protection from fire of valuable books, papers and documents and articles of various kinds, which may need such care and preservation. They have also received an estimate from Messrs. Stacy Reeves & Sons to construct and complete the same for the sum of $278. They therefore submit the following resolution:

Resolved, That the report of the Committee be accepted, and they are directed to have said fireproof constructed under the direction of the architect, in accordance with the plans prepared by them.

All of which is respectfully submitted.

J. Sergeant Price, *Chairman*.

On motion of Mr. Price, the report was accepted, and the resolution contained therein was adopted by the Society.

Mr. Williams offered the following resolution, which after discussion was adopted by the Society:

Resolved, That a Committee of three be appointed by the President, to consider and report to the Society upon the advisability of an annual grant for the purpose of aiding the publication or assuming the entire cost of publishing transcripts of the Babylonian tablets, on deposit in the Museum of the University of Pennsylvania.*

And the Society was adjourned by the President.

Stated Meeting, March 18, 1892.

Present, 9 members.

Mr. Wood in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the Société de Litteraire Finnoise, Helsingfors; K. Sachsische Gesellschaft der Wissenschaften, Leipzig; Meteorological Office, London; Museum of Comparative Zoology, Cambridge, Mass.; Department of State, Washington, D. C.

* The President subsequently appointed Messrs. Williams, Du Bois and Price as such Committee.

Letters of acknowledgment were received from Marquis Antonio de Gregorio, Palermo, Sicily (185), Sir J. W. Dawson, Montreal, Canada (136); Agricultural Experiment Station, Geneva, N. Y. (135, 136); Geological Society of America, Rochester, N. Y (136); Prof. Henry Morton, Hoboken, N.J. (136); Dr. Charles B Dudley, Altoona, Pa (134), Mr. R Meade Bache, Hon. Henry Reed, Philadelphia (136); Prof. Charles V. Riley, Washington, D. C. (136); State Experiment Station, Baton Rouge, La (135, 136); Washburn College, Kansas State Historical Society, Topeka, (136); Colorado Scientific Society, Denver, (136); Museo Oaxaqueño, Oaxaca, Mex. (136); Observatorio Astronómico Nacional, Mexicano, Tacubaya (136), Bishop Crescencio Carillo, Merida, Mex. (136).

Accessions to the Library were reported from the Société Litteraire Finnoise, Helsingfors, Colonial Museum, Harlem, Holland; Académie des Sciences, Cracow, Austria; Zoologisch-Botanische Gesellschaft, K. Geologische Reichsanstalt, Anthropologische Gesellschaft, Vienna, Austria; Instituto y Observatorio de Marina, San Fernando, Spain; Rousdon Observatory, Lyme Regis, Eng; Society of Antiquaries, Meteorological Council, London, Editors of the Journal of Philology, Cambridge; American Institute of Electrical Engineers, Prof. J. A. Allen, New York, Mr. William John Potts, Camden; College of Physicians, Mercantile Library, Superintendent of City Trusts, Mr. Henry Phillips, Jr., Philadelphia; Chief of Engineers U. S Army, Lighthouse Board, Bureau of Ethnology, Washington, D C.; Mr. William Harden, Savannah, Ga.; Agricultural Experiment Stations, Burlington, Vt, Geneva, N Y., State College, Centre County, Pa., Baton Rouge, La.

The decease of the following members was announced

John Couch Adams, Cambridge, England, January 21, 1892, æt. 73.

Dr. Hermann Kopp, Heidelberg, February 20, 1892, æt. 75.

Thomas Hockley, Philadelphia, March 12, 1892, æt. 54.

Dr. Cope presented some additional matter for his paper in the Transactions, which was ordered to be printed.

Mr. Phillips presented "A Second Contribution to the Study of the Folk-Lore of Philadelphia and its Vicinity."

Pending nomination No. 1233 was read.

The Library Committee reported a minute of its last meeting.

Mr Bache offered the following resolution:

Resolved, That, if the funds of the Society permit, this room be now put in charge of a Committee, for the purpose of receiving such treatment to its walls, ceiling and columns as accord with the character of the Society, and that the Society instruct the Curators to exclude from the cases everything but such printed matter as is desirable for ready reference, and from the floor any articles which are not conducive to the primary purpose in this room of convenience of the members of the Society."

After some debate, the consideration of the resolution was postponed until the next stated meeting of the Society

Dr. Morris moved that the Secretaries be requested to ask from the Academy of Natural Sciences, the Numismatic and Antiquarian Society and the Historical Society the return of all the articles belonging to this Society that are now deposited with them. After discussion, on motion of Mr. Price, as an amendment, it was resolved to refer the resolution to the Curators for the purpose of ascertaining and reporting to the Society exactly what these deposits consist of, where they are and the amount of space that will be required for their proper display in the building

Mr. Williams offered the following resolution:

Resolved, That the busts of Lafayette and Franklin, by Houdon, in the possession of this Society, be loaned to the University Lecture Association for its loan exhibition of French art, at the Academy of Fine Arts, provided that they be returned on or before April 1, under the usual stipulation by the Curators

And the Society was adjourned by the presiding member.

A Contribution to the Vertebrate Paleontology of Texas

By E D Cope

(*Read before the American Philosophical Society, February 5, 1892.*)

I. Fayette Formation.

In the First Annual Report of the Geological Survey of Texas (p. 47), Mr R. A. F Penrose, Jr, describes this formation as it occurs in South and East Texas. He places it at the summit of the Tertiary series and below the "Posttertiary," that is, at the summit of the Neocene, just prior to the advent of the Plistocene. This location is justified by the only vertebrate fossils definitely traceable to these beds, which have been sent me for identification by Dr E. T Dumble, State Geologist of Texas. One of these consists of a well-preserved left ramus with symphysis and nearly complete dentition of the mandible of the large lama, *Holomeniscus hesternus* Leidy. This species is characteristic of the Equus beds of Oregon, California and Mexico, and indicates satisfactorily the age of the formation in which it occurs. It confirms fully the position assigned to the Fayette beds by Mr Penrose. The only other identifiable fossil from this formation is several teeth of the *Equus major* Dekay. This species is most abundant in the Eastern States, where the Equus beds have not been certainly identified, but it occurs also in the Equus bed of Nueces county, Texas, with other characteristic species of that epoch. The specimens of the two species named came from Wharton county. This is the first exact determination of the age of the Fayette formation from paleontological data, and is therefore of much interest, as it enables us to correlate a definite horizon of the East with the Equus bed of the Pacific region. The determination of King and myself that the Equus bed is upper Pliocene is confirmed, since besides Penrose, Chamberlin assures us that the Fayette formation (Appomattox or Orange sand) is pre-glacial.

II. Upper Cenozoic of the Staked Plains.

In some remains of vertebrata, obtained by Mr W T Cummins, from Crosby county, Texas, and sent me for determination by Dr. E. T Dumble, State Geologist, three genera may be identified, and several others are indicated. The three genera are Equus, Mastodon and Testudo They are enclosed in a white siliceous friable chalk, which Mr Louis Woolman finds on examination to be highly diatomaceous. Prof. O. Henry Kain had identified the following species *Campylodiscus bicostatus* W Smith; *Epithemia gibba* Ehr.; *E. sebra* Ehr; *E. gibberula* var. *producta* Ehr, *Navicula major* Ehr., *N. viridis* Ehr, *N. rostrata* Ehr; *N elliptica* var. *minutissima* Green, *Gomphonema clavatum* Ehr., *Cymbella cistula*, Hemp; *Fragillaria virescens* Ralfs var The formation has been named the Blanco Canyon bed by Mr. Cummins (First Annual Report of the Geol. Survey

of Texas, 1890, p. 190) without exact determination of its position in the Cenozoic.

The Mastodon is of the *M. angustidens* type, as indicated by the teeth, but there are not enough fragments preserved to render it clear whether they pertain to this species or to some allied one. The Equus is allied to the *E. occidentalis* of Leidy, but the enamel plates are more simple than in that species, being the most simple known in the genus. I regard it as an undescribed species, and describe it below under the name of *Equus simplicidens*. A second species of horse is indicated, but an exact determination cannot be made without additional material. The tortoise is a terrestrial form. A water bird of which a tarsometatarsus is contained in the collection, is kindly determined for me by Dr. Shufeldt as allied to the rails.

EQUUS SIMPLICIDENS *sp. nov.*

This species is represented by one nearly entire superior molar of an adult, and one of a young animal, with characteristic fragments of two other superior molars, and several fragments of inferior molars. The size of the teeth is about that of the *E. occidentalis* and *E. caballus*. The internal column is of moderate anteroposterior extent, its posterior border marking the anterior third of the posterior lake. Its long diameter is considerably less than half that of the crown. A peculiarity found in two of the superior molars, but not in two others, is that the median dentinal connection between the external and median crescents is interrupted by the continuity of the enamel plates bordering the lakes from the one to the other. This arrangement is frequently seen in the large pm. 2, in the species of Equus, but does not occur in the other premolars and molars. It is a reversion to the condition seen in Anchitherium. A principal character of the species is seen in the extreme simplicity of the enamel borders of the lakes. They are without inflection, except the usual loop on the posterior inner border of the anterior lake, and this is simple and widely open at the base. At the point of junction of the median crescents (meta- and paraconules), the usual loop of the internal enamel border is seen. The external median rib is narrowed and not flattened, the anterior rib is more flattened, especially at the present grinding face.

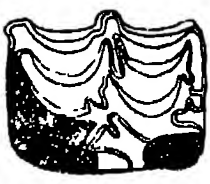


FIG. 1. *Equus simplicidens* Cope, crown of true molar of left side, natural size.

The species with which it is necessary to compare this species is the *Equus occidentalis* of Leidy. The enamel plates bordering the lakes in that species are always more complex, although they are simpler in it than in the other extinct species of North America. Even in the simplest forms (*e. g.*, that figured by Leidy in Vol. I, Report U. S. Geol. Surv. Terrs., 1873, Pl. xxxiii, Figs. 1, 2) the lakes have anterior and posterior

emarginations on the inner border, which are wanting in the present species.*

The species is probably the oldest member of the genus Equus known from North American beds. It is the only species which was contemporary with a Mastodon with the *M. angustidens* type of molars. The simplicity of the enamel foldings is appropriate to this primitive period, as it approximates to the condition seen in many of the three toed horses and the supposed one-toed *Hippidium spectans* Cope.† The size of the molars is about that of the modern horse, *E. caballus* L.

Observations.—The contemporaneity of this species of Equus with the Mastodon with molars of the *M. angustidens* type has considerable significance. The latter is characteristic of the Loup Fork horizon in North America, in which the genus Equus does not occur. The Equus beds, so named from the abundance of individuals of four species of Equus which they contain, have never produced a specimen of Mastodon allied to *M. angustidens* in North America.‡ The fact that the Equus of the Staked Plains is different from those of the Equus beds, adds to the indication furnished by the Mastodon that these beds do not belong to the Equus horizon; but the presence of the genus Equus is equally conclusive that they do not pertain to the Loup Fork. It is probable that the age of the beds is intermediate. They thus offer an interesting field for further research.

CRECCOIDES OSBORNII, Shufeldt, gen. et sp. nov.

Char. gen.—Only a fragment of a left tarso-metatarsus represents this new genus and species of bird. It evidently belonged to some wader of about the proportions of a medium-sized heron, or to a form rather larger than the Floridan crane-like rail Aramus.

The specimen consists of about the superior moiety of the tarso-metatarsus, and, in so far as it goes, appears to be perfect, with the exception of slight marginal abrasions of the summit of the bone and the almost complete fracturing off of the hypotarsial process. Superiorly, the intercondyloid prominence or tubercle is rounded and not especially conspicuous; the inner condyloid depression is more extensive than the outer one, and occupies a higher plane. In front the shaft is longitudinally excavated only above, the excavation gradually but soon disappearing as we pass down towards the distal extremity; and as the midpart of its

* The horse found in Florida by Mr. Wilcox, which Dr. Leidy identified as his *Equus fraternus* (Transac. Wagner Free Inst. Science, Philadelphia, 1889, p. 16), must be referred to a genus distinct from Equus, on account of the absence of cups of the incisors, by the loss of the internal wall. This is seen in both unworn and worn specimens. In some cases an internal cingulum remains to indicate its position. It appears to be a case of degeneracy. I have named the genus Tomolabis.

† *American Naturalist*, 1887, p. 1072.

‡ It is probable that the *Dibelodon shepardii* Leidy, which has molars of this type, occurs in the Equus beds of the valley of Mexico. Cfr. Cope, Proceed. Amer. Philos. Soc., 1884, May.

continuity it is subcylindrical upon section A short distance below the head of the bone are seen the usual anteroposterior perforating foramina, here three in number, two being lateral and below, with a mid one just above them Immediately below these is a single, somewhat prominent tubercle for the insertion of the tendon of the *tibialis anticus* muscle It occupies nearly a median position upon the shaft. So far as can be ascertained from the imperfect hypotarsial process it would appear that it possessed originally a large, single, inner groove for tendons, with a plate-like projection to its outer side

Char specif—Proximally, the tarso-metatarsus is considerably excavated to the inner side of the hypotarsus at a point just below the summit The outer muscular line is single and commences at the middle point of the margin of the outer condylar depression, passing from thence down the back of the shaft The inner muscular line bifurcates proximally, then passes more obliquely backwards than the outer line, to finally pass parallel with the latter also down the back of the shaft

Measurements.

	mm
Greatest transverse width of proximal end	15
Greatest anteroposterior diameter of prox end, not including hypotarsus	11
Distance from apex of intercondyloid tubercle to the tubercle for tib. ant muscle	10
Vertical depth of hypotarsus	10
Transverse diameter of shaft near its middle......	6

Remarks—This fragment has been compared with the corresponding part of the skeleton in a great many kinds of birds. It was found to differ entirely from all larine, gallinaceous and raptorial types, while on the other hand it seemed to combine the characters of several various species of existing waders and allied groups. The writer compared it with numerous species of the genera Guara, Plegadis, Aramus, Rallus, Crex, Porzana, Ajaja, Tantalus, Botaurus, Ardea, Nycticorax, Grus and the Gallinules, Storks, etc.

For a skeleton of *Crex pratensis* I am indebted to Mr F E Beddard, prosector of the Zoölogical Society of London, and for the loan of other material to the United States National Museum, as well as to Mr F A Lucas, of that institution, for placing the same at my disposal In the specimen under consideration, the Ralline characters appear to predominate, while more remotely we may see Ibis in its general form and outline. Apart from the question of size it, however, distinctly differs from the tarso metatarsus in such a form as *Aramus giganteus* in that the shaft was more cylindrical as it approached its midportion, and, as has been said above, did not show the anterolongitudinal excavation in that part. Moreover, in Aramus the hypotarsus exhibits *two* grooves for the passage of tendons, and the tubercle for the insertion of the *tibialis anticus* muscle

is double. Essentially, it agrees with Aramus in the *general form* of its hypotarsus and in the direction of its lateral muscular ridges. In other particulars it exhibited both some minor differences and agreements with the corresponding bone in the skeletons of Crex and Rallus. Upon the whole the specimen would appear to have belonged to some large rail like wader, now extinct.

The name of the genus I create to contain this form is composed of the two Greek words, κρέξ, a crake, and εἶδος, resemblance. Its specific name is given it in honor of Prof Henry F Osborn, of Columbia College, New York, in recognition of his excellent work in paleontology for a number of years past.

The specimen was collected by Mr W. T. Cummins, and is at present in the possession of Prof. E. D. Cope, to whom the writer is indebted for the honor of having been permitted to describe it —*R. W. Shufeldt.*

TESTUDO TURGIDA sp. nov

This species is represented by the greater part of a chelonite of about the size of the *Xerobates agassizii* of Arizona. It is remarkable for the remarkable depth of the dermal sutures and sculpture lines, and for the swollen character of the interspaces which separate both. The general shape is a short, wide oval, with steep to vertical margins.

The plastron is widely emarginate posteriorly, and the anal femoral dermal sutures form a deep notch in the border The anal scuta are oblique rhomboids, with equal and nearly parallel sides The median longitudinal dermal suture is deep and wide, cutting half through the thickness of the plastron It sends off a branch on each side bounding the gular plates in front. The part of the plastron enclosed in the latter forms two flattened cones appressed together, whose vertical diameter exceeds the transverse, and whose subconic apices are separated by a deep notch. The interclavicular bone is very large and is wide diamond-shaped, the anterior angle being larger than the posterior. The transverse humeropectoral suture is very deep, and is similar to the median longitudinal. The borders of the anterior lobe are strongly convex, with a chord only twice as long as the lateral border of the gular plates

The nuchal bone has a strongly concave-emarginate border On the posterior vertebral bones is a seat like concavity, which is surrounded by a ridge which forms the greater part of a circle. The costal bones are unequally divided by the costal dermal sutures, which are very deep Each costal scutum is divided into two areas, one of which is marked with ribs parallel to the vertebral axis at one extremity and a seat-shaped plane with a bordering ridge at the other, which is in some of the costals smaller and more swollen. The other half or part of the costal scutal area is swollen in the longitudinal direction, but not for its entire length. The marginal bones are massive and have a subacute border between the bridge and the median points. They are much deeper than long, and are deeply divided by the sutures which separate the dermal marginals. These

grooves cut the margin into deep notches at some points and into shallower ones at others. The areas between these sutures are all swollen in the same way as the alternate parts of the costal plates.

Measurements.

		MM.
Length of plastron anterior to posterior angle of interclavicle		80
Width of plastron anterior to posterior angle of interclavicle		112
Length of interclavicle		40
Width of interclavicle		58
Thickness of interclavicle		11
Length of free lateral margin of gular plate		29
Width of base of both gular plates		45
Length of xiphiplastral bone		83
Width of xiphiplastral bone on anterior suture		52
Width of emargination of posterior lobe of plastron		50
Diameters of free marginal near bridge	anteroposterior	30
	vertical	64
	transverse below	25
Diameters of marginal of bridge	anteroposterior	29
	vertical	44
	transverse below	31
Diameters of penultimate vertebral bones	anteroposterior	17
	transverse	30

The American tortoise, which has produced gular areas somewhat like those of this species, is the *Testudo cultratus* Cope of the White River Neocene of Colorado. That species is, however, totally different in the dermal sutures of the usual character, flat marginals, etc., and the gular processes are not conic, but trihedral in form.

The specimen above described comes from Espuela near Dockum, from the same horizon as that of Crosby county, or the Blanco Canyon bed of Cummins.

III. On a Mesozoic Pycnodont.

MICRODUS DUMBLII sp. nov.

This species is represented by a splenial bone of the left side, which supports four and a half rows of teeth. The external two rows include small teeth with crowns, which are either round or slightly transversely oval. The teeth of the third row are larger and the crowns are all transversely oval. The teeth of the fourth row are of unequal sizes, commencing anteriorly of about the same size as those of the third row. The third tooth from the front, as preserved, is much larger, but it is exceeded by the fourth; while the fifth is half as large again as the fourth. The sixth and last is a little smaller than the fifth. The teeth of the fifth row are as

small as those of the first and second rows, and extend posteriorly to the anterior part of the fourth of the fourth row, and not beyond. The crowns of the teeth are perfectly smooth and without keel or depression.

		M.
Length of tooth series		17
Six teeth of external row		10
Six teeth of third row		11.5
Six teeth of fourth row		16.5
Diameters of fifth of fourth row	anteroposterior	3
	transverse	7

The horizon of this species is not exactly known, but it is probably Lower Cretaceous. It gives me much pleasure to dedicate it to Dr. E. T. Dumble, Director of the Geological Survey of Texas.

IV. Triassic or Dockum Beds.

The fossils from these beds present a general similarity to those obtained elsewhere in the Trias. Fragments of large Stegocephali are abundant, and Crocodilians of the Parasuchian group are still more so. Teeth like those of the Eastern Clepsysaurus and Zatomus also occur. The number of identifiable species is small, and the best preserved of these is a new representative of the genus Episcoposaurus Cope, already described from the Triassic bed of New Mexico.*

Episcoposaurus haplocerus sp. nov.

I refer to this species the following pieces which were found together by Mr. W. T. Cummins. A dorsal and probably two caudal vertebræ, a scapula of the right side, a few fragments of ribs, and about thirty dermal bones. The generic characters and those of higher value may be first described.

The single dorsal vertebra is from the posterior part of the series. Its articular surfaces are shallowly concave. The neural arch is not entirely coössified, part of the sutural surface being visible in the fracture, from which the neurapophysis has been broken. There is a rib facet at each end. The smaller, which is longer than deep, is continuous at an open angle with the tubercular articulation of the short diapophysis. The other is longer than deep, lenticular in outline, and terminates acutely above. The scapula is massive, and the inferior extremity is thinned below and turned obliquely inwards. No procscapula. The coracoid facet is not large, and is separated by an angle from the glenoid cavity. The ribs are flat, not very wide, and have one subacute edge. The head of one is attached to the dorsal vertebra, above described. The capitular and articular surfaces are subequal and are separated by an angle. The dermal bones are thick and are united by suture, so as to form transverse bands across the body, but are not united in the anteroposterior direction. Some

*Proceedings Amer. Philos. Soc., 1887, p. 218.

of them have median tuberosities, which are developed in others into horn-like spines. These form rows on the opposite sides of the middle line, as they are unilaterally symmetrical

Char specif.—The dorsal vertebra above referred to has the centrum slightly wider than deep. Its inferior surface is contracted on each side, and is slightly concave on the middle line. The surface is smooth. The diapophysis is robust, subtriangular in section, and it does not project freely beyond the centrum The centrum of a caudal vertebra with chevron facets, is deeper than wide, and has robust diapophyses, which spring principally from the centrum The outline of the articular face is a hexagon elongate vertically This is partly due to the broad truncation of the inferior face. Concavity of centrum slight

Measurements of Vertebra and Ribs.

		m
Diameters of dorsal	anteroposterior	66
	vertical	64
	transverse	75
Diameters of caudal	anteroposterior	59
	vertical	59
	transverse	51
Vertical diameter of head of rib attached to dorsal, above mentioned		46
Transverse diameter of capitulum of do		36
Transverse diameter of shaft of another rib		40
Thickness of shaft of another rib		15

The section of the scapula is everywhere lenticular It is robust, rather short, without much constriction at the base, and but a moderate expansion above A distinct clavicular facet is not preserved The incurvature of the inferior surface is most abrupt anteriorly, the angle there amounting almost to a tuberosity

Measurements of Scapula.

		m
Length on external face from superior border to line of superior edge of glenoid cavity		141
Diameters at narrowest part	anteroposterior	60
	transverse	33
Diameters glenoid cavity	vertical	63
	transverse	40

The *dermal bones* are subquadrate in form, and have sutures on two opposite sides and thin edges on the other opposite sides. The inferior surface is more or less concave from one sutural border to the other. They are all coarsely pitted, but the pits are reduced in size towards the edges in some of the plates. In many of the plates there is a prominent obtusely conic tuberosity placed unsymmetrically near the centre or edge of the

plate. This tuberosity is in some of the plates developed into a prominent spine or horn, which has an anteroposteriorly oval section The surfaces of the tuberosities are punctate. These horns are placed on the sides, and probably not far from the median line, since they form with the adjacent tuber bearing plates a strong angle, such as would be necessary to enclose the neural spines of the vertebral column It is also not certain whether these spines were on the dorsal, cervical or caudal regions, or whether they were on all of them The plates adjacent to those bearing spines are the most robust. The spines are gently curved, probably backwards.

Measurements of Dermal Plates

		MM
Diameters of plate without knob	anteroposterior	90
	transverse	78
	vertical at suture	16
Diameters of plate with knob	anteroposterior	100
	transverse	70
	vertical at suture	37
Diameters of plate with spine	anteroposterior	115
	transverse (chord)	65
	vertical at suture	35
Elevation of spine of plate last, measured from base (apex restored)		190
Diameters of spine at base	anteroposterior	95
	transverse	65
Diameters of spine 45 mm. below apex	anteroposterior	30
	transverse	20
Diameter of pits on flat bone		5
Diameter of pits on knobbed bone		9

In comparison with the only species of the genus known thus far, the *H. horridus*, from the Triassic bed of New Mexico, the present species has the tuberosities and horns of a different shape. In that species the former are compressed and keel-like, and the horns are also compressed, having an edge in front and a triangular section. The individual which served as the basis of the description of the *H horridus* is also of rather smaller size than the present one.

On Tiaporus, a New Genus of Teiidae.

By E. D. Cope.

(Read before the American Philosophical Society, March 4, 1889.)

TIAPORUS FULIGINOSUS, gen. et sp. nov.

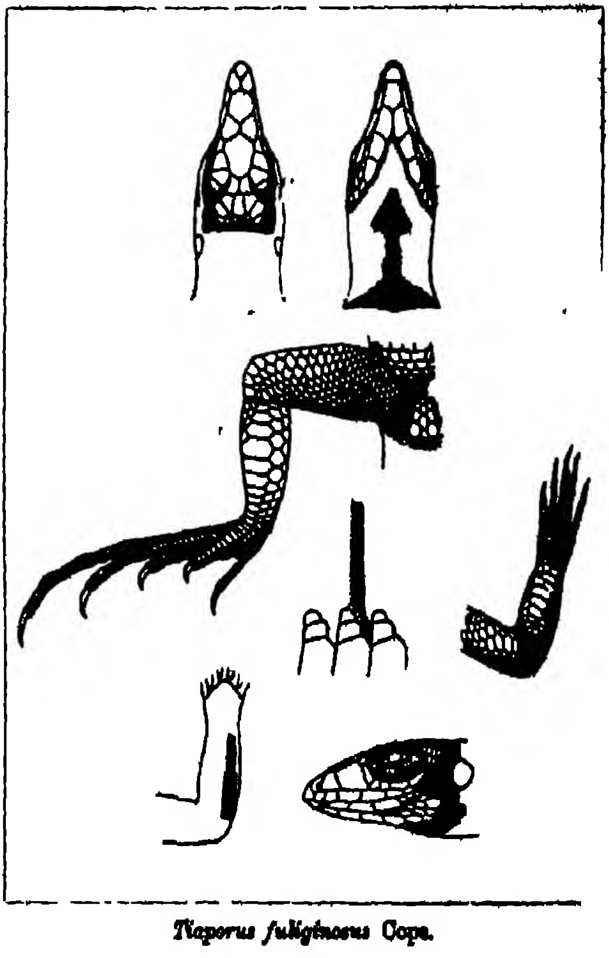
Char. gen.—Tongue cylindric and sheathed at the base; no femoral pores; abdominal scales smooth, a cervical collar fold, tail cylindric. Digits 5–5.

This form is identical with Ameiva, except in the absence of femoral pores. Monoplocus Gthr. has no femoral pores, but the tongue is not sheathed, and the abdominal scales are keeled.

Char. specif.—The squamous surface of the tongue is ovate posteriorly and not notched. The apex of the tongue is deeply bifurcate. The teeth of the maxillary bone are compressed, and have a principal compressed apex, and one or two denticles of the edges near the base. The rosettes of scales, which in other genera surround the femoral pores, are present, but the pores are absent.

The animal is about the size of the *Ameiva cœrulea* Cope. The dorsal scales are minute, measuring 0.9 mm. The abdominal plates are in twelve longitudinal and thirty-two transverse rows. They are smooth, and those of the external row are smaller than the others. The nostril is on the suture between the nasal plates. The parietals are divided into two and sometimes into three plates, the internal of which is wider than the interparietal. The latter is smaller than each frontoparietal. Supraorbitals, four; supraciliaries, six; no frenoorbital. Head rather elongate and acuminate; labials 7; infralabials, three large and two small, separated from labials by two rows of large scales. A few rows of scales on the middle of the mesoptychium equal those of the gular region, which are a little larger than those of the neck, which are equal to those on the posterior part and edge of the gular fold. The brachial scales are not large, and are in three or four rows, separated by small scales from a few small postbrachial scales near the elbow. The antebrachial scales are not continuous with the brachials, and are in one large external and two or three smaller internal rows. No postantebrachials. Femorals in 12–14 rows, the third from the front large, the posterior six rows not imbricate. Tibial scales in five rows, the external much larger. Anal plates with five or six large marginals, and five in front of them, four arranged round a small central one. Caudal scales narrow, numerous, not oblique, keeled, but not uncinate. No spurs.

Color above brown, sometimes with a lead-colored shade. Below lead color, with an olive tinge, to nearly black. A black band from temporal region to above femur present in all the specimens. In three specimens there are traces of one or two brown bands on the middle dorsal region



Tiaporus fuliginosus Cope.

anteriorly; in one of these also an interrupted black lateral band below the one already described. Below this there are in the same specimen two rows of blackish spots on the sides, the inferior on the lateral ventral scales. In a ♀ there is a row of small pale spots above and below the superior lateral black band.

Total length, 310 mm., length to angle of mandible, 30 mm., do. to collar, 38 mm.; do. to axilla, 45 mm.; do. to vent, 100 mm; do. of foreleg, 40 mm., do. of forefoot, 17 mm; do. of hind leg, 88 mm., do. of hind foot, 47 mm.

This remarkable species has no particular resemblance to any known species of Ameiva or Cnemidophorus. Four specimens, No. 14,710 U S. National Museum Register, from Swan Island in the Caribbean Sea Collected by Charles Townsend.

Swan Island is off the northeastern coast of Honduras, at a distance of about two degrees of latitude. It is about five degrees west by south of Jamaica. It was visited by the U. S Fish Commission steamer *Albatross*, and Mr. Townsend, the naturalist of the expedition, obtained this species with several others. The present form is related to Ameiva as Monoplocus is to Centropyx.

Explanation of Plate.

Fig. 1 Head profile *a*, from above, *b*, from below, fig. 2, anterior limb from above, *b*, forearm from below; fig. 3, hinder limb with anal region from below; fig. 4, portion of side of body.

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A Sketch of the Life of Joseph Leidy, M D., LL D.

By W S W. Ruschenberger, M D.

(Read before the American Philosophical Society, April 1, 1892.)

The Academy of Natural Sciences, of Philadelphia, devoted the stated meeting of May 12, 1891, to commemorate its President, Dr. Joseph Leidy, who died April 30. The meeting was very large and impressive. Drs William Hunt, Harrison Allen, Henry C. Chapman, James Darrach, Edward J Nolan, Prof Angelo Heilprin and Mr Joseph Willcox, by appointment, delivered appropriate addresses, and the Rev. Dr. H C McCook, Mr. Isaac C Martindale, Dr James J. Levick and others eulogized the dead President.

A more affectionate tribute has seldom been paid in this city to the memory of a votary of science. Ample testimony was adduced that Dr Leidy had attained distinction among scientific men at home and abroad, and that he had the warm sympathy and respectful regard of all those members of the Society with whom he had been in any degree associated

In the first hours, while a great bereavement is still fresh, love and admiration so obstruct perception that the extent of the loss sustained may be sometimes overstated But let whoever may conjecture that in this instance some of the addresses were too fervid, consult the cold records of the Academy in which are faithfully set down his works since he entered the Society, and he will find that they justify the encomiums pronounced.

Loyalty to truth and ingenuousness were shining features of Dr Leidy's nature.

The first paragraphs of Dr William Hunt's opening address on Dr. Leidy's personal history are cited here in illustration:

"It is fitting that we imagine the beloved subject of our discourses this evening to be with us in spirit, as he doubtless is in influence, and to let him introduce himself as I heard him do in Association Hall some years ago when he was about to give a popular lecture. I was unexpectedly called upon to introduce him. 'What!' said I. 'Who is to introduce the introducer? Here's a man more widely known to the city and to the

world than any of us.' Dr. Leidy, hearing the conversation, said: 'Oh! Dr. Hunt, keep your seat, I don't wish to be introduced; I'll introduce myself.' And, stepping to the rostrum, he spoke in this way:

"'My name is Joseph Leidy, Doctor of Medicine. I was born in this city on the 9th of September, 1823, and I have lived here ever since. My father was Philip Leidy, the hatter, on Third street above Vine. My mother was Catherine Mellick, but she died a few months after my birth. My father married her sister,* Christiana Mellick, and she was the mother I have known, who was all in all to me, the one to whom I owe all that I am. At an early age I took great delight in natural history and in noticing all natural objects. I have reason to think that I know a little of natural history, and a little of that little I propose to teach you to-night.'"

Dr. Leidy's ingenuous introduction of himself suggests that a fuller account of his ancestors may be acceptable.

Carl Leidy, the forefather of the American-born Leidys, came to America from Rhenish Germany in the early part of the eighteenth century (about 1724), and settled in that part of Penn's province which now includes Montgomery and Bucks counties, Pa.†

*Erroneous.—His mother died May 28, 1825 (soon after her son Thomas was born), twenty months after the Doctor's birth. His father's second wife was a cousin and not a sister of Dr. Leidy's mother, as stated. See, The Story of an Old Farm, or Life in New Jersey in eighteenth century. By Andrew D. Mellick, Jr., Somerville, New Jersey, 1889.

†Genealogical Notes.—Carl Leidy's son, Carl Ludwig, b. Dec. 30, 1729, and his wife, Ursula Elizabeth, b. Feb. 8, 1734, had issue: (1) John Jacob, b. Nov. 7, 1753; (2) George Heinrich, b. Oct. 19, 1755; (3) Margaretta, b. Nov. 15, 1757; (4) Eva Christina, b. Dec. 25, 1759; (5) Anna, b. Oct. 1, 1761; (6) Magdalena, b. Dec. 18, 1763; (7) Carl, b. Aug. 29, 1765; (8) Anna Maria Elizabeth, b. Feb. 24, 1768; (9) George Ludwig, b. July 1, 1770; (10) Maria Catherine, b. May, 1772. Both parents and children were natives of Hilltown township, Bucks county, Pa.

John Jacob Leidy, the first-born of this family, m. April 16, 1777, Catherine, b. March 16, 1757, a daughter of Christian Comfort. They had issue: (1) Charles Ludwig, b. Jan. 7, 1778; (2) Henry, b. Jan. 12, 1779; (3) Catherine, b. May 16, 1780; (4) Maria Margaretta, b. March 1, 1782; (5) Jacob, b. Jan. 18, 1783; (6) Christian, b. Jan. 3, 1784; (7) George, b. Oct. 7, 1786; (8) Conrad, b. Nov. 25, 1788; (9) Philip, b. Dec. 4, 1791, d. Oct. 8, 1863; (10) Emanuel, b. Dec. 22, 1794; (11) Frances Fanny, b. March 6, 1796. All were natives of Hilltown township, Bucks county, Pa.

Philip Leidy, the ninth child of the preceding family, m. Oct. 6, 1818 (he was then settled in Philadelphia), Catherine, a daughter of Peter and Rachel Mellick. She was born in Bloom township, Columbia county, Pa., Jan. 27, 1790, and died in Philadelphia, May 28, 1825. They had issue: (1) Peter, b. Dec. 25, 1819, d. Aug. 29, 1820; (2) Catherine, b. Aug. 7, 1821, d. Nov. 20, 1823; (3) Joseph, b. Sept. 9, 1823, d. April 30, 1891; (4) Thomas, b. May 21, 1825, d. April 20, 1870.

Philip Leidy m., May 25, 1826, Christiana Taliana, a cousin of his first wife. She was born in Philadelphia, July 29, 1797, and died Jan. 6, 1861. They had issue: (1) Christiana T., b. Feb. 22, 1827, m. June 4, 1850, James Cyrus Umberger, d. Oct. 24, 1878; (2) Francis, b. Dec. 14, 1828, d. June 2, 1856; (3) Asher, b. July 30, 1830, d. July 6, 1878; (4) Helen, b. Sept. 30, 1833, d. Dec. 3, 1836; (5) Catherine Mellick, b. March 28, 1837, d. Aug. 12, 1839; (6) Philip, b. Dec. 29, 1838, d. April 29, 1891. All born in Philadelphia.

Peter, the forefather of the Mellick family, came to America from Rhenish Germany about the close of the sixteenth century (1695).

German and English, it may be said, were vernacular languages to the members of the Leidy and Mellick families generally—the German came to them as a birthright, and English from their environment.

The name first appears in the City Directory for 1809—"Leidy, Jacob, shoemaker, 9 Summers' Court." Prior to that year the Leidys probably lived either in Bucks or Montgomery county All of them who exchanged a country for a city residence were of the class called "plain people," composed of well-to do and respectable workers—men whose individual energies when united constitute the national strength and are almost exclusively the progenitors, in aftermaths, of millionaires, consequently of aristocratoid or "first families" and gentry, often more boastful of ancestry than of creditable achievement The name of Philip Leidy, hatter, the father of our subject, first appears in the City Directory for 1817, and that of his brother, Conrad, bootmaker, in 1820 At those dates they were established in business. During several years before that time they resided in the city Both volunteered in the War of 1812–15 against Great Britain and served with those at Camp Du Pont The Leidys named in the City Directories for 1809 and for several years thereafter were mostly mechanics, makers of hats, boots, chairs, etc., and probably had been apprentices and learned their trades in the city One of their contemporaries, now an influential citizen advanced in years, remembers that "all the Leidys were smart."

Philip Leidy, who was born in Montgomery county, Pa., December 5, 1791, is spoken of as a powerful man whose stature was rather more than six feet and in every way well proportioned Though not conspicuous for mental force he was naturally endowed with practical good sense. His educational acquirements were limited; but his industry, honesty and frank deportment secured him confidence and respect wherever he was known. He made and sold hats, did a good business, and had many customers from the adjoining counties as well as in the city. He was a member of the German Lutheran Church in New street, and with his family habitually attended its services.

Dr. Leidy said in his self-introduction, every word in a halo of grateful love, my stepmother "was the only mother I have known, who was all and all to me, the one to whom I owe all that I am."

Besides being notable in the management of domestic affairs, she possessed a large share of tact and of good womanly qualities. She was intellectually the superior of the family, had literary taste, wrote verses sometimes, was ambitious, and desired that her children should be well educated and that her sons should study the professions.

Through her influence Joseph, at the age of about ten years, was sent to the Classical Academy, a private day school conducted by the Rev. William Mann, a Methodist clergyman There he studied English and read Latin—Historia Sacra, Viri Romæ and Virgil—the principal being scrupulously careful that his pupils should understand the grammar. Probably he began Greek also

Minerals and plants interested him at an early age Mr Mann encouraged the cultivation of this taste. One day an itinerant lecturer from the so-called "Universal Lyceum" visited the school, and, by permission,

discoursed about mineralogy, illustrating his lesson with specimens. Young Leidy was so much interested that soon after he procured books on mineralogy and botany and diligently studied them. At length he became so fascinated in the pursuit that he often absented himself from school without leave to seek specimens in the rural districts near the city Parental chidings for delinquencies of this kind did not always restrain him His self-will and eagerness to hunt for minerals and plants often caused him to forget those admonitions and follow the inclination of the hour

The conduct of the boy, his spontaneous ways, are in many instances forecasts, in outline, of the characteristic features of the man he will become, and therefore it is interesting to observe those surroundings which may influence their development.

At the time Joseph entered the academy, Mrs Burris, a respectable colored woman, a widow, lived near and did laundry work for support. Her son, Cyrus, a bright youth a few years older than Joseph, was errand boy in the hatter's shop His chief duty was to deliver hats at the homes of their purchasers, and for each errand of the kind he received six or twelve cents, according to the distance he had to walk

There were then three schools at no great distance apart Mr. Collom and Mr Livensetter charged three dollars a quarter for each pupil and Mr. Mann twelve dollars The boys of the two schools were at war with those of the academy, and they had a fight whenever they met in the street.

Apprehensive that her son might be assaulted by some of those "rowdy boys," Mrs. Leidy engaged Cyrus to accompany him to school. These two became intimate friends and often went together botanizing.

Cyrus Burris is now a well preserved man, of pleasant deportment, and of more than seventy five years of age He is intelligent and has a retentive memory.

In answer to questions, Cyrus related substantially that Mr Leidy once took all his family for a picnic out where Fortieth and Baring streets are now, and he went with them to carry things and be useful. At that time plenty of weeds grew on the side of the hill. They at once attracted the young professor, who found that he did not know any of them But Cyrus, who had been brought up in the country, near Burlington, N. J., had there learned to know and name the herbs and weeds in his neighborhood, was able to tell him the names of many of them. This show of superior information pleased him so much that afterwards Cyrus was his chosen companion on botanical excursions

His favorite hunting ground was along the banks of the Schuylkill and Wissahickon On the way, on one of their early walks, they strolled into Mr. Henry Pratt's famous grounds at Lemon Hill The late Mr. Robert Kilvington, a practical and proficient botanist, then had charge of the hothouses and garden. He noticed Leidy, and kindly answered his

questions, regarding him as a poor, intelligent boy who was striving to instruct himself. This was the beginning of an enduring friendship. In a short time Mr Kilvington cheerfully assumed to be his systematic instructor, and, after his pupil had become distinguished, complacently mentioned to friends that he had been Leidy's botanical preceptor

On one occasion Cyrus and the young professor spent a whole day in Bartram's garden, near Gray's Ferry, and did not reach home till night.

"The professor," as Cyrus styled him, "used to say that the valley of the Wissahickon was the best place in the neighborhood to find plants. He very soon knew more about them than I did. Sometimes we went all day with nothing to eat but raw turnips we got out of the fields, for the old man was stingy of spending money to his boys, though he was always a bountiful provider of the very best things in the market for them at home. Once we went into Jersey, and that was the only time I ever cheated the professor We saw in a thick bush a big snake, four or five feet long, with a white spot under his throat. The professor wanted to catch him, so he gave me a carpet bag to hold open on one side of the bush for the snake to run into, while he frightened him out from the other. The snake came hissing along towards me I jumped aside—I couldn't help it—and let him get away, but I never let on that I was scared."

In the course of his schooldays the young naturalist, besides gathering stones and plants, caught butterflies and bugs, which he pinned in a box prepared for the purpose, to be arranged in his cabinets at home

Cyrus stated, among other things, that he sometimes acted as caterer and waiter for the lads on special occasions; and that whenever the boys came into the hatter's shop, their father always talked to them in German He also said that Dr. Leidy had taught him a great deal about plants and their medicinal uses, adding, "Through what I learned from him, I have been able through many years to make a decent living."

The offspring of almost constant companionship during their boyish days, at home or in the fields, was a personal sympathy, a friendship which, to the credit of both, was life long, notwithstanding the extreme difference and distance between the social places each occupied in adult age. The professor gave him, at different times, several books on medicine, and among them his *Elementary Treatise on Anatomy*, in which is written, "To Cyrus Burris, from his old friend, the author" Those are Cyrus' treasures He quietly but, no doubt, proudly shows them to a favored few.

The future professor did not own shinny or hockey stick, kite, skates nor ball, never played marbles, nor whistled nor hummed a tune at any time.

He was a good boy in school, always neat and tidy, and never joined his schoolmates in their out of door sports during the hour of daily "recess," but sat the while at his desk, pencil in hand, portraying some natural object, as a snail shell, carefully and beautifully shading it, or drawing caricatures suggested by acts of his fellow pupils.

He had no teaching to develop this talent. The high artistic skill which he acquired was exclusively due to self-cultivation. A small book of his portraits of shells, dated February, 1833, has been preserved, which show his skill with a pencil in his tenth year

According to his school champion, who, the boy always declared was the best Greek scholar in the academy, "Joseph Leidy never sized up to the other boys."

His schooldays ended in his sixteenth year, probably about the last of July, 1839.

His worldly condition required that he should now be taught some art by which to earn a livelihood As he had manifested at an early age uncommon aptitude in draughting and drawing, his father conjectured that he would best succeed as a sign painter But the son, who had passed much of his leisure in the wholesale drug store of his cousin, Napoleon B. Leidy, M D, "physician and druggist," as the City Directory styled him, fancied that he would rather be an apothecary.

In compliance with his preference he was placed with an apothecary and in the course of a few months acquired such a degree of knowledge of drugs and the method of compounding them, that he was considered qualified to be left in temporary charge of the retail business.

His loving stepmother, however, was not satisfied She seemed sure that there was in him the making of a successful physician Her arguments at last prevailed With the consent of his father, rather reluctantly given, it was agreed that he should study medicine

In the autumn of 1840, he became a pupil of Dr. James McClintock, then a private teacher of anatomy in College avenue. His father's proposition to pay the preceptor's fee in hats was accepted, but the settlements provoked dispute and at last estrangement of the parties

Parts of 1840 and 1841, more than a year, were devoted to practical anatomy under the able instruction of Dr McClintock During the first half of 1841 he parted from Dr McClintock, who, having accepted the office of Professor of Anatomy in the Castleton Medical College, in Vermont, removed from Philadelphia in 1842.

Leidy matriculated at the University, October 26, 1841, and was under the instruction of Dr. Paul B Goddard, then Demonstrator of Anatomy in the University and Prof. Horner's prosector. He was a promising surgeon, a man of bright qualities. In conjunction with Mr. Robert Cornelius he was the first in Philadelphia to make a daguerreotype. He devoted his leisure evenings in his office, with a few intimate friends, to microscopic studies, and there young Leidy received his first lessons in the use of the microscope.

Having attended three courses of lectures and submitted a thesis on *The comparative anatomy of the eye of vertebrated animals*, the degree of Doctor of Medicine was conferred upon him, April 4, 1844, by the University of Pennsylvania

In the year after graduation, he was an assistant in the laboratory of Dr.

Robert Hare, Professor of Chemistry, during six weeks, and then entered that of Dr James B. Rogers, lecturer on Chemistry in the Medical Institute of Philadelphia, from 1841, and remained there through the summer course. On the retirement of Dr. Hare, in 1847, Dr Rogers succeeded him in the University *

He was now prepared to begin the practice of any branch of medicine he might prefer, but he had yet to learn how to make the profession of commercial value to himself No plan of proceeding was immediately formed. In August, 1844, on foot with several companions, he visited Harvey's lake, Bethlehem, Mauch Chunk, also the Beaver Meadow and Hazleton coal mines In a letter to a sister he wrote: "Pedestrianated to Wilkesbarre and arrived at Berwick yesterday, August 28, having walked from the lake to this place, thirty five miles, the longest distance I have ever walked in one day."

In the autumn he opened an office, No. 211 North Sixth street, hoping to obtain employment as a general practitioner. But the business which came to him during two years' trial did not promise a satisfactory living, and therefore he determined to devote himself exclusively to teaching. Possibly his failure to obtain practice was ascribable in some degree to lack of due attention to patients. Years after this time, to show how intently attractive comparative anatomy was to him, he related to his private class that on one occasion he was so absorbed in his office studying the anatomy of a worm that he totally forgot that he had been called to an obstetric case which he had engaged to attend. Later in life he would have felt that unbridled eagerness to learn the structure of a worm is an inadequate plea for forgetting a professional or other engagement.

An unhappy experience, which occurred shortly after he began the practice, tended to disgust him with it and may have been one reason among others why he abandoned it Ten years afterwards he narrated substantially that, called to a child suffering "with all the symptoms of tubercular meningitis," he informed the parents that medicine in such a case is inefficacious Nevertheless, they requested him to visit it. At the end of a week a much older practitioner was called, and attended the child till it died. He then "informed the parents that he could have saved the life of the patient had he been called at the time of Dr. Leidy's first visit." †

In 1845, on the resignation of Dr. Goddard and the appointment of Dr. John Neill, Demonstrator, in his place, the Professor of Anatomy,

* Biographical Notice of Joseph Leidy, M D By the Editor "The New Jersey Medical Reporter and Transactions of the New Jersey Medical Society" Edited by Joseph Parrish, M D., Burlington, N. J Published by S W Butler, M D Ninth month, September 20, 1853, Vol. vi, No 2. It is understood that this notice had the approval of Dr Leidy

† See p. 14, Valedictory Address to the class of medical graduates of the University of Pennsylvania, delivered at the public commencement, March 27, 1858. By Joseph Leidy, M.D., Professor of Anatomy Published by the Graduating Class. Collins, Printer, Philadelphia, 1858.

Dr. Horner, appointed Dr Leidy his prosector. In 1846 he was chosen Demonstrator of Anatomy in the Franklin Medical College, but resigned the office at the close of the session, in 1847, resumed his position with Dr Horner and delivered to his students a private course of lectures on Human Anatomy

He indulged himself with a short vacation in July, 1846, and visited his friends, Messrs. Haldemann, at Chickies, Pa.

While his kinsman, Dr. N B Leidy, was Coroner of the County of Philadelphia (1845–48), he acted as Coroner's Physician and received fees for the autopsies he made

In the spring of 1848, impaired health induced Prof. Horner to visit Europe He invited his friend, Dr Leidy, to be his traveling companion They sailed in April and returned in September In England, Germany and France they "visited hospitals and anatomical museums, and sought out eminent anatomists and surgeons." Dr. Leidy witnessed in Paris, June 20, some vivisection experiments by Magendie, in his physiological laboratory, which interested him They "were in Vienna while the revolutionary movements were in progress" and "were also in Paris during the fierce conflicts from 23d to 26th of June; and during several days afterwards they "witnessed in the hospitals, filled with wounded, every variety of gunshot wound and the modes of treatment pursued"*

On his return from Europe, in the autumn, Dr. Leidy delivered a course of lectures on Microscopic Anatomy; and in the spring of 1849 began a course on Physiology in the Medical Institute of Philadelphia, which the condition of his health required him to abandon †

He edited *Quain's Human Anatomy*, which was published June, 1849, by Lea & Blanchard

An interesting event enabled Dr. Leidy to go abroad again under very favorable circumstances. Dr George B Wood, who was elected May, 1850, Professor of the Practice of Medicine in place of Dr. Nathaniel Chapman, resigned, desired to collect in Europe models, casts, preparations, etc., suitable for objective illustration of his future courses of instruction Aware of the artistic judgment of Dr Leidy, and of his recently acquired knowledge of localities in which objects adapted to his purpose could be purchased, Dr. Wood easily persuaded him to be his companion and assistant in hunting and selecting desirable specimens.

Dr. Wood had proved, while Professor of Materia Medica from October, 1835, till May, 1850, that placing before his class appropriate objects illustrative of his subject is superior, more successful than the purely oral and

* A discourse commemorative of William E Horner, M D, Professor of Anatomy, delivered before the Faculty and students of the University of Pennsylvania, October 10, 1853. By Samuel Jackson, M D, Professor of the Institutes of Medicine. Published by the Class. Philadelphia, 1853

† Sketch of Joseph Leidy. By Edward J. Nolan *The Popular Science Monthly*, September, 1880. This sketch was read and approved by Dr. Leidy

didactic method of instruction. For this reason he was confident that it would be equally useful, though perhaps more difficult to accomplish, in teaching that to which materia medica is merely subservient. With special reference to his intended system of instruction, he visited the most celebrated schools in Europe, and at a cost of many thousands of dollars, purchased models, castings and drawings of many pathological specimens. "These formed a cabinet of morbid representations unique in this country, and supplied material for a course of medical tuition which was as instructive and satisfactory as it was interesting and novel."*

Dr. Wood was the first to teach the practice of medicine in a series of "object lessons," by placing before his class models, casts, etc., appropriate to the illustration of each lecture.

At the end of his holidays in Europe, Dr. Leidy resumed his routine work in the University. He was elected a Fellow of the College of Physicians of Philadelphia, August, 1851. He seemed to be not much interested in the pursuits of the Society, seldom attended its meetings, and was not a contributor to its Transactions.† He was Secretary of the Committee on Lectures, under the Mütter Trust, from January, 1864, and kept a neat record of its proceedings. In November, 1883, "on account of his scientific achievements," the College exempted him from future payment of annual contributions.

He lectured on Physiology in the Medical Institute of Philadelphia in the summer courses of 1851 and 1853.

He was appointed in 1852 Pathologist to St. Joseph's Hospital, a purely nominal position.

Failing health had disabled Prof. Horner. With approval of the Trustees and the Medical Faculty of the University, Dr. Leidy, as his substitute, delivered the course of lectures on Anatomy for 1852–53.

Dr. Horner died March 13, 1853, and in May Dr. Leidy was elected Professor of Anatomy.

He was yet in the thirtieth year of his age. His educational opportunities and collateral advantages may have been less than those of his predecessor and friend, but from the hour he resolved to be a teacher he probably hoped some day to fill a Professor's Chair. The unremitting exercise of his natural abilities, his ever eager quest of knowledge enabled him to publish, prior to this time, many works which won for him praise

* Memoir of George B. Wood, M.D., LL.D. By S. Littell, M.D. (read October 1, 1879). Transactions of the College of Physicians of Philadelphia, Vol. xii, 1881.

† At a meeting of the College, May 5, 1886, he related that he had recently examined three nematoid worms, found in the intestines of young cats sent to him from Chicago, and read a letter from Durango, Mexico, reporting the great prevalence of scorpions in that district. He also exhibited "photographs of trichinæ in the flesh of the pig." In answer to a remark by a Fellow of the College that it had been repeatedly stated in Berlin that the trichinæ had been found there in the pig prior to the time when Dr. Leidy announced his discovery of it, he said: "I believe mine was the first notice of the parasite occurring in the pig." *Transactions of the College of Physicians of Philadelphia*, third series, Vol. viii, 1886, pp. 41–43.

and a name, and proved him to be an eligible candidate, and, after an unusual trial of his aptitude for the office, fairly secured his preferment.

A brief notice of his predecessors in the same Chair is submitted to show in what respects he resembled them.

The medical department of the University of Pennsylvania has always been happy in selecting men of marked ability and acquirements to fill its professorships. At the start the Trustees elected (September, 1765) two professors. Dr John Morgan, to whom the credit of founding the Medical School of the University belongs, was appointed Professor of Medicine, which embraced the practice of physic, materia medica and pharmaceutical chemistry, and Dr William Shippen, Jr, Professor of Anatomy and Surgery, when he was twenty-nine years of age He also taught midwifery Their first courses of lectures began in November, 1765. He was an eminent general practitioner of medicine and a surgeon of the Pennsylvania Hospital during nearly twelve years.

Dr. Caspar Wistar, at the age of thirty-one years, was appointed, January, 1792, adjunct, and after the death of Dr. Shippen, July 11, 1808, Professor of Anatomy.

Desirous to improve the method of teaching anatomy, Dr Wistar had made gigantic models, exactly proportioned, of several minute and intricate structures—of the internal ear, for instance—which he used as objective illustrations of his lectures

His collection of numerous models and anatomical preparations was presented, after his death, by his family to the University, and by resolution of the Trustees, styled "The Wistar Museum"

Dr Wistar published, in 1811, *A System of Anatomy*, which was a text-book during many years. He was versed in botany, mineralogy and chemistry He was a surgeon of the Pennsylvania Hospital more than sixteen years, and always among the most eminent and beloved practitioners of medicine in the community

On the death of Dr Wistar, January 22, 1818, Dr. John Syng Dorsey was appointed, but died November 12, 1818, a week after the delivery of his introductory lecture. The course on anatomy for 1818–19 was completed by Dr Physick, with the assistance of Dr William E. Horner.

Dr. Philip Syng Physick, an eminent surgeon, who had been Professor of Surgery from June 4, 1805, was elected Professor of Anatomy July 13, 1819, and resigned in 1831 He was a surgeon of the Pennsylvania Hospital for twenty two years, and rendered important services to the public during the epidemics of yellow fever in 1793 and 1798.

Dr William E. Horner was elected adjunct in 1820 and Professor of Anatomy in 1831. He, a native of Virginia, had been a surgeon's mate in the Army of the United States from 1813 to March, 1815, and served on the Niagara frontier in the war of that period.

Dr Wistar appointed him, March, 1816, his prosector, at an annual salary of $500.

From 1820 he was a surgeon of the Philadelphia Almshouse during

twenty four years. His private practice was large. In 1823 he published *A Treatise on Practical Anatomy*, in 1826, *A Treatise on the Special Anatomy of the Human Body*, in two octavo volumes, which passed through eight editions, and at different times contributed valuable papers to the medical journals.

The numerous pathological and anatomical preparations made by himself, which were appraised at $10,000, he bequeathed to the Wistar Museum. In acknowledgment of this valuable bequest, the Trustees of the University decreed that it should be named thenceforward the Wistar and Horner Museum

The anatomical chair, under the lustre shed upon it by the professional skill and eminence of its occupants, had become notably conspicuous. They resembled each other so much in their works and ways that it seems not difficult to imagine that a kind of composite portrait of Shippen, Wistar, Physick and Horner may ever mark the Chair which they in succession so admirably filled from 1765 to 1853, about eighty-seven years, before Dr. Leidy was installed

The University of Pennsylvania appointed Dr Leidy its delegate to the American Medical Association in 1854 at St Louis, Mo, and in 1872 at Philadelphia, but he did not directly contribute to its Transactions at either meeting The Committees of the Association on Medical Literature and on Medical Science cited with encomium his papers, *On the Comparative Structure of the Liver*, *On the Intimate Structure and History of the Articular Cartilages*; *On the Intermaxillary Bone in the Embryo of the Human Subject*, published in the "American Journal of the Medical Sciences," for 1848 and 1849, and *On Parasitic Life*, printed in the Proceedings of the Academy of Natural Sciences of Philadelphia

Dr Leidy was on the list of permanent members of the Association from 1854 to 1876 At the St. Louis meeting he was appointed Chairman of a Committee on Diseases of Parasitic Origin, and member of a Committee on Prize Essays, but no report from either has been recorded.

In 1861 he published *An Elementary Treatise on Human Anatomy*, and in 1889, the work having been out of print many years, a second edition, rewritten and enlarged. The illustrations are largely from his own drawings of many recent dissections made by him in connection with this work. A peculiar feature of the volume is that English names of the parts are given in the text, and their old Latin names in footnotes, under a belief that the subject thus presented would be more readily understood by students

Philip Leidy, the father of the professor, died October 9, 1862, in the sixty seventh year of his age.

In 1862, when the "Satterlee," a U S. Army Hospital, was established in West Philadelphia, Surgeon I. I Hayes, U S V, in charge, a number of leading teachers and medical practitioners of Philadelphia volunteered their services as ward physicians, and received contracts as acting assistant surgeons. To Dr. Leidy was assigned the task of conducting

the autopsies and reporting them, from time to time, to the Surgeon-General of the Army. A number of pathological specimens prepared by him accompanied his reports. They have been preserved in the Army Medical Museum in Washington. He made about sixty autopsies, of which his reports are published in "The Medical and Surgical History of the War of the Rebellion."* In this capacity he served from 1862 to 1865.

His brother, Dr. Philip Leidy, was assistant surgeon of the 105th Pennsylvania Infantry from November 1, 1861, till September, 1862, when he was appointed surgeon of the 119th Regiment of Infantry, and served in the field till he was honorably discharged, June 19, 1865. He was present in nearly all the battles of the Army of the Potomac, evincing courage and devotion to his duties "with the rare qualities of a gifted man." His official reports to the Surgeon General are published in the history above named.

Dr. Joseph Leidy was appointed a member of the Sanitary Commission Association, April 8, 1862, and September 11, "The State of Pennsylvania, Executive Office of the Military Department at Harrisburg," appointed him Chief Surgeon within the old limits of the city of Philadelphia.

August, 1864, he married Anna, a daughter of Robert Harden, of Louisville, Ky. To compensate for the sterility of this union, they some years afterwards adopted the infant daughter of a deceased friend. Dr. Leidy told the writer that had this dear child been his own he could not have loved her more. He was fond of children. The crying or hilarious romping of the playmates of his young daughter in the study did not in the least degree disturb or divert him from his work.

Since his reports to the Surgeon General of the Army the only paper connected with the science of medicine from his pen found in print is an essay on Intestinal Worms, included in *A System of Practical Medicine by American Authors*, edited by William Pepper, M.D., LL.D., etc., assisted by Louis Starr, M.D., etc., published by Lea, Brothers & Co., Philadelphia, 1886. This essay—largely derived from foreign publications—occupies thirty five pages of the second volume. At the close of this paper, Dr. Leidy states that for much of his information he is indebted to the articles on "Intestinal Parasites" and "Diseases from Migratory Parasites," in Ziemssen's *Encyclopædia of the Practice of Medicine*.

After he relinquished practice to devote himself exclusively to teaching, no branch of the healing art attracted or practically engaged his attention. From this circumstance his father, who unwillingly consented that he might study medicine, was probably led to say that "a first-class sign-painter had been spoiled to make a poor doctor."

Dr. Leidy delivered courses of lectures on comparative anatomy in the University, and on pure human anatomy as part of the medical curriculum,

* Vol. I, Part 1, and Vol. II, Parts 1 and 2.

seldom adverting to its useful applications in surgery or the practice of medicine, but not merely for the sake of imparting knowledge of his subject He carefully taught human anatomy as a means of self-maintenance. And within his domain he zealously wrought to promote the welfare of the medical department of the University, the principal source of his livelihood. This was his serious occupation, his work, which to all concerned was always acceptably done, during thirty-eight years. In all that period he was absent from his post through indisposition in the aggregate only five days

His pastime, while not engaged in his appointed task, was somewhat different though not less laborious. To increase knowledge of natural things, animate or inanimate, gigantic or microscopic, seemed to be a ruling passion, and, like a true huntsman, he cared less for the capture than for the pleasure of pursuing his game

It may be truly said that Dr Leidy was born to be a naturalist. To his innate ability to perceive the minutest variations in the forms and color of things was united artistic aptitude of a high order These natural faculties, in continuous exercise almost from his infantile days, and his love of accuracy, enabled him to detect minute differences and resemblances of all objects, and to correctly describe and portray them Besides, nothing, however small, that came within the scope of his vision, while walking or riding, escaped his notice.

He says (p. 294) of his work on *Fresh Water Rhizopods*, 1879 "The study of natural history in the leisure of my life, since I was fourteen years of age, has been to me a constant source of happiness, and my experience of it is such that, independently of its higher merits, I warmly recommend it, than which, I believe, no other can excel it. At the same time, observing the modes of life of those around me, it has been a matter of unceasing regret that so few, so very few people give attention to intellectual pursuits of any kind."

His first important work in natural history was begun in the winter of 1844, at the instance of Mr Amos Binney, President of the Boston Society of Natural History It is entitled, *Special Anatomy of the Terrestrial Gasteropoda of the United States* By Joseph Leidy, M.D., of Philadelphia. Quarto, pp 169; illustrated by 16 plates, containing 120 figures

This admirable essay is included in the first of the three handsome volumes of Mr. Binney's work.* In the Preface Mr Binney says: "The author is gratified in announcing that the anatomical details of the species, together with the dissections and drawings, are exclusively due to the labors of Joseph Leidy, M.D., of Philadelphia They constitute the most novel and important accessions to science contained in the work, and are

* *The Terrestrial Air-breathing Mollusks of the United States and the Adjacent Territories of North America*; described and illustrated. By Amos Binney Edited by Augustus A Gould. Charles C Little and James Brown. Boston, 1851. Quarto, Vol I, pp. 366, 16 plates, Vol. II, pp 362, 74 plates; Vol III, pp. 162, 57 plates

Mr Binney died February 18, 1847

an honorable evidence of a skill and industry which entitle him to a high rank among philosophical zoölogists."

Dr. Leidy, in 1845, contributed three papers—anatomical descriptions of mollusks named—to the Boston Society of Natural History, which were published in its Journal and Proceedings.

On nomination by Dr Samuel George Morton and Messrs. John S. Phillips and John Cassin, Dr. Leidy was elected a member of the Academy of Natural Sciences of Philadelphia, July 29, 1845, then at the northwest corner of Broad and Sansom streets

At that period natural history interested comparatively few persons in the community, and by those few was regarded chiefly as a rational pastime.

A brief retrospect of the subject, which is nearly associated with Dr. Leidy's career, may be permitted to recall its ancient standing and progress in public estimation.

John Hyacinth de Magellan, of London, in 1786, gave to the American Philosophical Society (of which he was chosen a member January, 1784) two hundred guineas, to be a permanent fund, the interest thereof to be annually awarded by the Society in premiums "to the author of the best discovery or the most useful invention, relating to navigation, astronomy or natural philosophy (*mere natural history only excepted*) "*

This exception, though seemingly contemptuous, was wise. Had naturalists been eligible to receive those premiums, Dr Leidy alone, who almost annually discovered many genera and species, might have earned the whole income of the fund. Magellan's opinion, which was probably common in his day, seems to have been that to discover and describe natural species of any kind is comparatively so easy, requires so little inventive aptitude and intellectual force, and the discovery itself imports so little to the good of mankind that such work needs no encouragement. A century's experience has modified this notion in many respects.

Natural history attracted very little attention in Philadelphia during the first quarter of the present century. There were some botanists, but very few were interested in other branches of natural science.

A half dozen gentlemen who, at chance meetings, often discussed questions connected with the subject, formally assembled, January, 1812, at the residence of one of them, to form a natural history society They styled themselves "Friends of science and rational disposal of leisure moments." After due consideration at several meetings they founded, March 21, 1812, "The Academy of Natural Sciences of Philadelphia "

* John Hyacinth de Magellan, a Portuguese physicist, was born in Lisbon in 1723. He claimed that Magellan, the first circumnavigator, was one of his ancestral kinsmen.

He long sojourned in the convents of St Augustin, of which he assumed the habit, and removed to England about 1764, to devote himself to the study of physical science, and died at Islington, near London, January 7 1790.

He was elected a member of the Royal Society of London, 1774, and was also a member of the Academies of Paris Madrid and St Petersburg *Nouvelle Biographie general depuis les temps les plus reculés jusqu'a nos jours. Firmin Didot, Frères, Paris,* 1860.

To rationally dispose of leisure moments; to foster peaceful study of natural things, as a wholesome diversion of the mind from the mental weariness and waste incident to idlers, quite as harmless, and more useful than contending at a game of chess; and to communicate freely to each other, as well as to the world, the results of their studies and spontaneous investigations were the chief motives which led its members to institute the Society and promote its progress.

Many books of reference, to tell students what had been already ascertained, and collections of numerous natural objects, to compare with those supposed to be new, are indispensable implements of a naturalist, but no individual was able to obtain them. Immediately after founding the Society the members saw this urgent need, and together began to form a library and a museum for their common use.

Looking forward to a time when the members of the Society would be numerous, and possibly might include zealous supporters of different religious creeds and rival political parties, the founders were somewhat apprehensive that a source of discord might arise in meetings of men holding conflicting opinions on these subjects, and for such reason agreed from the outset that, on entering the premises of the Society, every member should leave his religion and politics behind him at the door, and that debate of religious or political questions should be always out of order. This unwritten By-Law, solely designed to preserve harmony, though well understood by the members, was misconstrued outside of the Society.

Educated people, generally, then regarded the study of natural history to be in some vague way antagonistic to religion, and erroneously supposed that its votaries must be atheists or at best deists, and, therefore, to be avoided. The above unwritten By-Law, which, according to vulgar rumor, required members on joining the Society to give up religion, sustained the popular error.

During the first quarter of a century of the Academy's existence, natural history was not a part of the curriculum in any school or college in our country, because its economic value was not generally understood. Most of the Society's members were self taught. They met in the evening once a week and before the meeting was called to order, passed some time harmoniously conversing about their studies. Their aim was to encourage spontaneous investigations and to make the Academy a practical school of natural history. No one then imagined that knowledge of it would ever become, as it is now, marketable knowledge, a part of the stock in trade of the teacher's beneficent vocation. At that time the chief incentive to the study was pure love of it, without hope of renown or emolument.

When Dr. Leidy joined the Society its library contained about 12 000 volumes, and its museum representative collections of thousands of specimens in all departments of natural history, besides chemical and other apparatus. He had at once use of all these resources, and the encouragement which flows from the fellow feeling of many comrades working on the same line. He often said in after years that, without the facilities

found in the Academy, he could not have succeeded in many of his original researches.

Dr Leidy was elected Librarian December, 1845. He resigned at the end of the year, and the Academy voted him thanks for his efficient service. In December, 1846, he was elected a Curator, and was continuously Chairman of the Board till he died—more than forty-four years.

During all that time he virtually directed and managed the affairs of the museum. To him it was a congenial occupation—helped him in the line of his pursuits.

At the weekly stated meetings of the Academy the Chairman of the Curators usually invited attention to any notable addition to the museum. In this connection his verbal communications, which are recorded in the Proceedings, are very numerous, and were always seemingly delivered and heard with pleasure. An examplary specimen of them is, as follows

At a stated meeting of the Academy, October 6, 1846, Dr Leidy announced substantially that he had lately detected an entozoon in the thigh of a hog, which "is a minute, coiled worm contained in a cyst. The cysts are numerous, white, oval in shape, of a gritty nature, and between the thirtieth and fortieth of an inch in length." He *supposed* it "to be the *Trichina spiralis* heretofore considered as peculiar to the human species. He could perceive no distinction between it and the specimens of *T. spiralis* which he had met with in several human subjects in the dissecting rooms, where it had been observed by others, since the attention of the scientific public had been directed to it by Mr Hilton and Prof. Owen."*

In an address, delivered May 1, 1886, he said: "I recall to mind an occasion upwards of forty years ago, while I was a student assisting my preceptor, Dr Goddard, the Demonstrator of Anatomy in the University and Prosector to Prof. Horner. We were making preparations for a lecture on the muscles when Dr Goddard, who was endowed with quick perception and sharp vision, observed an appearance in the flesh which led him to examine it with the microscope. In it he found a number of minute coiled worms to which he called the attention of Prof Horner. The parasite had been discovered a short time previously by the English surgeon, Sir James Paget, and was described by Prof. Owen with the name *Trichina spiralis*. Several years later I found the same parasite in pork."†

It appears that the existence of trichinæ in the human subject was first noticed in England in 1833.

On the 22d of January, 1833, Mr. John Hilton read a paper before the Medico-Chirurgical Society of London, entitled, "Notes on a peculiar

* *Proc. Acad. Nat. Sc. of Phila.*, Vol iii, pp. 107-8, 1846.

† "An Address on Evolution and the Pathological Importance of the Lower Forms of Life." By Prof. Joseph Leidy. Delivered before the graduating class of the Medical Department of the University of Pennsylvania, May 1, 1886. Reprinted from the *Therapeutic Gazette* for June 15, 1886. George S. Davis, Detroit, Mich., 1886.

appearance observed in human muscles, probably depending upon the formation of very small cysticerci. By John Hilton, Demonstrator of Anatomy at Guy's Hospital."

He states substantially that Procter, aged seventy, was admitted into the hospital for a cancer, and died three months after "Between the [muscular] fibres, and having their long axis parallel to them, are situate several oval bodies, transparent in the middle and opaque at either end, altogether about one-twenty-fifth of an inch in length. No organization could be discovered with the aid of a microscope."*

At a meeting of the Zoölogical Society of London, February 24, 1835, Mr. Owen read a description of a microscopic *Entozoon*, infesting the muscles of the human body †

In the *Transactions of the Zoölogical Society of London*, Vol. i, pp 315–23, is the same paper, "By Richard Owen, Assistant Conservator of the Royal College of Surgeons in London," with a plate. In that paper Mr Owen states in substance that Mr Paget, an intelligent student at St. Bartholomew's Hospital, observed that muscles of the body of an Italian barometer-maker, who died January 29, 1835, aged fifty, were beset with minute whitish specs," and that Mr Paget, aided by Mr. Brown and Mr John Bennet, at the British Museum, at the same time satisfactorily determined the existence of the entozoon

Mr Wormald, Demonstrator of Anatomy at St. Bartholomew's Hospital, stated that he had noticed more than once the same condition during previous anatomical seasons, and at the request of Mr. Owen, soon furnished him ample materials for microscopic examination from the subject above mentioned. Mr Owen at once described the entozoon, which he named *Trichina spiralis*, and reported the result of his investigation to the Zoölogical Society.

Dr Henry J Bowditch, of Boston, was the first American who noticed the *Trichina spiralis*.‡

No one had ever suggested a source of or how this parasite found its way into the human subject until Dr Leidy, while eating a piece of ham at his own breakfast table, discovered its existence in the hog. In announcing his discovery, with his usual caution, he said that he *supposed* it to be the *Trichina spiralis* described by Owen This may be a reason why it was not generally recognized at the time The publication of it in the Proceedings of the Academy was copied in full in the *Annals and Magazine of Natural History*, Vol. xix, p. 358, London, 1847, and Drs. F Küchenmeister and F. A. Zürn state, in their work on the *Parasites of Man*, that "Leidy found, in 1847, the parasite in the muscle of pigs."§

* *The London Medical Gazette* for February 2, 1833, Vol. xi, p 605.

† See Proceedings Zoöl. Soc

‡ His observations are published in the *Boston Med. and Surg. Jour* for 1842 and 1844,

§ Dr. T Spencer Cobbold, a chief English authority on the subject, in his work on Entozoa, published in 1864, cites Dr Leidy in his bibliography, but does not mention him in his text in reference to *Trichina*.

The discovery that *Trichina spiralis* infests the hog is, in its economic relations, among the most important observations Dr Leidy ever made.

Very soon after Dr. Leidy's discovery became generally known in Europe, the importation of American pork by Austria-Hungary, Germany, etc., was arrested, under a belief that American hogs are very often infested by this parasite. Recently, however, relying upon the system of inspection established by American authority, American pork is no longer excluded from European countries in which immense quantities of pork are consumed in the form of smoked meat, imperfectly cooked. Whether the Germans suppose, as has been asserted, that one pound of raw pork contains as much nourishment as a pound and a quarter well cooked, or prefer the taste of it simply smoked, is an open question. Be this as it may, it is now known that thorough cooking renders trichinous pork harmless

Though the most ancient of lawgivers declared swine to be "unclean," unwholesome food, it does not seem supposable that he anticipated Leidy and knew that the pigs of his time were infested by this microscopic parasite

Trichinæ found now in man, it is believed, are derived from the hog, but whence the hog receives the parasite has not been demonstrated.

Dr Leidy was chosen a member of the American Philosophical Society October 19, 1849. Though not frequently present at its meetings, he contributed several papers to its Transactions and Proceedings.

Need of very much more space to properly accommodate the rapidly growing library and museum of the Academy had been apparent for some time, and had become so pressing that, early in 1866, measures were adopted to supply the want. Forty members were appointed a committee to solicit citizens generally to contribute to a Building Fund. Dr. Leidy was one of them, but it is believed that his modesty prevented him from actively participating in the work A trust was created. The contributors were to elect thirteen members of the Academy Trustees of the Building Fund, with authority to purchase a site and erect thereon a suitable edifice. They represented the contributors, to whose bounty alone the Academy would be indebted for the proposed new building. When the subscriptions amounted to $100,000, the fund was placed in the custody of the Trustees.

This method of procedure was designed to remove the subject from the meetings of the Academy, and to avoid delays in construction, which, it was conjectured, might arise from officious meddling of non-contributing members, if the work were confided to a Committee of the Society.

Dr Leidy was elected a member of the first Board of Trustees of the

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See, *On Poisoning by Diseased Pork*, being an essay on trichinosis or flesh-worm disease, its prevention and cure By Julius Althaus, M.D, M R C P., London, Physician to the Royal Infirmary for Diseases of the Chest, 8vo., pp. 84. John Churchill & Sons, London, 1864

Also, *Animal Parasites and Messmates*. By P. J. Benedén, Professor at the University of Louvain; correspondent of the Institute of France, with 83 Illustrations. D Appleton & Co., New York, 1876.

Building Fund, January, 1867, and was regularly reëlected till the close of his life. The work of the Board was not in harmony with his previous experience or taste. For this reason, perhaps, and because he unreservedly confided in the business ability of his colleagues rather than on his own, he did not warmly participate in it, though none was more desirous of its satisfactory achievement.

During his student days, and for years after graduation, Dr Leidy was generally held to be poor; but he had already acquired a local reputation on account of his knowledge of natural history, and was regarded to be a young scientist of unusual promise He attracted the attention of some prominent citizens, among them Dr James Rush, to whose beneficence the city is indebted for the Ridgeway branch of the Philadelphia Library. Mrs. Rush was frequently pleased to make him a lion at her evening parties. At that time many persons were pleased to believe that he strongly resembled the conventional likeness of our Saviour. Both Dr and Mrs. Rush were his friends and admirers during their lives.

Mrs. Rush died October 23, 1857 After that event Dr Leidy often dined *tête-à-tête* with Dr Rush

Dr Rush died May 26, 1869 Dr Leidy was invited to be a pall-bearer at the funeral, and at the same time received an intimation that he should not fail to be present. He accepted the invitation.

A few days afterwards he was greatly surprised by the receipt of a bank cheque for $500. He learned that Dr Rush had named those friends whom he desired to be his pallbearers, and that he had instructed the executor of his estate to give $500 to each of those who served in that capacity at his funeral.

At its summer commencement of 1869, the Franklin and Marshall College, Lancaster, Pa., conferred upon him the honorary degree of *Legum Doctor*—LL.D.

In the spring of 1871 he was appointed Professor of Natural History in Swarthmore College, eleven miles from the city, in Delaware county, and lectured there at 10 o'clock A.M., at first once in the week and subsequently twice. He resigned the office in June, 1885, but continued his connection with the institution as emeritus or retired professor

The Secretary of War invited him, May 6, 1873, to be the senior member of the scientific corps during an exploration of the route of the Pacific Railroad. This invitation was declined.

In December, 1874, he was offered the Hersey Professorship of Anatomy in the University of Harvard, at an annual salary of $4000.

He passed the summer of 1875 in Europe, visiting museums in London, Paris, Berlin, and mingling socially with renowned professors and distinguished votaries of natural science wherever he halted.

He spent the greater part of two seasons exploring the country around Fort Bridger, the Uinta mountains and Saltlake basin in search of materials for his treatise on *Fresh Water Rhizopods of North America*,

under the auspices of the U. S. Geological and Geographical Survey of the Territories, then directed by Dr. F. V. Hayden. The work was published in 1879. Dr. Leidy states, January 1, in his introduction to it, that during four years he had studied these Rhizopods as they occur in all the fresh waters of the country from the Atlantic border to an altitude of 10,000 feet in the Rocky mountains, and gratefully refers to the generous hospitality and aid received from Dr. J. Van A. Carter, formerly of Fort Bridger, who conducted his expeditions to the Uinta mountains and defrayed their expenses. Various railroad companies granted him entirely free transportation, or at half fare, so that to the Survey the expenses of this admirable work, besides the charges incident to its publication, amounted to about $233.

His friend, Mr. Joseph Willcox, relates that while they were visiting the "bad lands" of Wyoming, he asked Dr. Leidy, "What beauties do you see in this forbidding territory?" In reply he said, "This is a most interesting place to see, where no living animal or plant exists. I enjoy the novelty of this anomalous locality. You will all agree with the man who appropriately compared this place to the infernal regions after the fires had been put out."

During many years Dr. Leidy habitually visited the Twelfth Street Market in search of specimens, and became quite intimate with Mr. R. M. Holbrook, who is a large dealer in fresh fish, etc., and is also Treasurer of the Market Company.

Speaking of Dr. Leidy, Mr. Holbrook said, "He was a man of such simplicity of manner that he drew all classes of persons to him, even children would stop and listen to him.

"At one time a few years ago he got from me a specimen of some kind of fish and wrote an article about it, in which he gave me the credit of furnishing the specimen. The article was copied in a London journal, but by mistake gave my name as the author. As soon as he saw it Dr. Leidy came and asked me whether I had written much for the papers. He then told me of the mistake, laughed heartily, and seemed to enjoy it very much.*

"And he told me about the publication of his book on Rhizopods. And on my expressing a hope that he was well paid for his work, he said that all he got for his labor was twenty copies of it and that he was satisfied.

"At another time he told me that he had just received an unexpected remittance from Boston; that he had written a paper for the Walker prize the year before and had not received anything, but this year in consideration that his papers were good both years the committee had awarded him a double prize. His childlike manner in telling me about it, without reference to the sum of money he had received, and without the least tinge of egotism or conceit, showed that he wished me to enjoy his success with him.

* At a stated meeting of the Academy, May 18, 1870, Dr. Leidy "called attention to errors in published reprints of the Academy's Proceedings in foreign journals."

"He usually came to market about six o'clock in the morning before the crowd began, and sat behind the stall a half hour or more talking and watching the men while they were cleaning fish. He was always pleased to carefully examine whatever might be found in the stomachs or intestines of the larger varieties. The entrails of very big ones were sometimes sent to his house that he might inspect them at his leisure. And if anything strange came along—for whatever comes into the fisherman's net is fish—it was sent to him. Sometimes he wrote the Latin name of an uncommon kind on a scrap of paper, which my men copied in large letters and, sticking it on the specimen, displayed it on the stall. For example, on one scrap he wrote, 'Horse Crevalle—Caranx hippus. Cape Cod to the West Indies. Belongs to the Pilot-fish family and related to the Mackerels,' on another, 'Pensacola black grouper—Trisopteris microlepis;' and on a third, 'The Massachusetts Tile Fish—Monacanthus Massachusettensis.'"

The Boston Society of Natural History, January 22, 1880, "Voted that the Walker Grand Honorary Prize for 1879 be awarded to Prof. Joseph Leidy for his prolonged investigations and discoveries in zoölogy and paleontology, and in consideration of their extraordinary merit the sum awarded be $1000."*

In August, 1880, an invitation to lecture and supervise the scientific studies of the postgraduates of Princeton College, N. J., was declined.

In December, 1881, he was elected without competition President of the Academy of Natural Sciences of Philadelphia, and continuously held the office till he died.

About the year 1866 it was suggested that natural history should be taught in the University. The proposition was entertained and discussed from time to time, and lingered on without action. In 1882, under the propulsive and successful administration of Dr. William Pepper, the distinguished Provost of the University of Pennsylvania (whose policy apparently is to enlarge the institution and foster within it every branch of

* Dr. William J. Walker, a generous friend of science, who died at Newport, R. I., April 2, 1865, placed in trust of the Boston Society of Natural History means of awarding prizes for the best memoirs, written in English, on subjects proposed by a committee, appointed by the Council of the Society. The first and second prizes to be awarded annually, and the third once in five years, beginning 1870.

First.—For the best memoir presented a prize of $60 may be awarded, which sum, at the discretion of the Committee, may be increased to $100, if the memoir be of marked merit.

Second.—For the next best memoir a prize of not exceeding $50 may be awarded, provided it be of adequate merit in the opinion of the Committee.

Third.—Grand *Honorary Prize.* The Council of the Society may award the sum of $500 for such scientific investigation or discovery in natural history as may be deserving thereof in its judgment, provided such investigation or discovery shall have first been made known and published in the United States of America; and at the time of said award shall have been made known and published at least one year. "If in consequence of the extraordinary merit of such investigation or discovery, the Council of the Society should see fit, they may award therefor the sum of $1000." *Proc. Boston Soc. Nat. Hist.*, Vol. x, p. 146, [illegible].

human knowledge which may be profitably taught), a school of natural history was devised and instituted under the modern style of Department of Biology, and Dr. Leidy was appointed, for the current academic year, Professor of Biology (Zoölogy) in the Faculty of Philosophy.

In 1884 the department was organized by the appointment of a Faculty of seven professors, including Dr Leidy as Professor of Zoölogy and Comparative Anatomy, and he was elected, May 6, Director of the Biological Department.*

It was proposed, March 16, 1885, that his salary should be $6000, on condition that he should resign his position in Swarthmore College, which he did, and give his time exclusively to the University

A laboratory, an herbarium and an appropriate museum were started. To the latter Dr Leidy contributed many of his skillfully made preparations, and bequeathed to it an herbarium of about 1400 species of plants, collected by himself.

In this connection the University Marine Biological Association has been founded, with laboratories and aquaria located at Sea Isle City, N. J.

The Geological Society—Burlington House, London, January 5, 1884—awarded to Dr Leidy the Lyell Medal, with its accompanying purse of £26, in recognition of his important services to paleontology.

About the close of the year 1883 the attention of Dr Leidy was invited to a subject which he had not previously considered

Mr Henry Seybert, a firm believer in modern spiritualism, who died March 3, 1883, aged eighty two years, not long before his death gave to the University of Pennsylvania a sum of money sufficient to found a Professorship of Philosophy, on condition that the University should appoint a commission to investigate "all systems of morals, religion or philosophy, which assume to represent the truth, and particularly of modern spiritualism."

Ten gentlemen, most of them members of Faculties or of the Board of Trustees of the University, were constituted a commission to investigate modern spiritualism. Dr Leidy, with one or more members of the commission, attended twelve sittings with reputed spiritualist mediums, from March, 1884, to April, 1887. The commission submitted a preliminary report of its proceedings May, 1887.†

The Trustees of the Wagner Free Institute of Science elected him, July 27, 1885, President of the Faculty and Professor of Biology, at an annual salary of $500 From that date the Trustees obtained his views before deciding any question relating to the scientific policy of the Institute, and appointed members of the Faculty subject to his approval. He lectured two or three times every season, and always attracted a large audience. In the spring of 1890, lectureships superseded the Faculty system, and

* University of Pennsylvania. Handbook of Information, concerning the School of Biology, Philadelphia, 1889.

† Preliminary Report of the Commission appointed by the University of Pennsylvania to investigate Modern Spiritualism, in accordance with the Request of the late Henry Seybert, 12mo, pp. 160 J. B. Lippincott Company, Philadelphia, 1887.

Dr. Leidy was elected Director of the Museum June 8, 1890, and spent some of his last days in planning a synoptical arrangement of it.

He was authorized by the Trustees to expend $3000, while in Europe in 1889, in the purchase of specimens for the museum, and on his return $1000 more were placed in his hands to be spent in the United States for objects of the same kind. His interest in the growth of the museum and library was constant. He presented many books and specimens collected by himself.

At its summer commencement of 1886, Harvard University conferred upon him its honorary degree of *Legum Doctor*—LL.D ; and the Institute of France awarded to him, December 18, 1888, the Cuvier prize medal.

He had now reached the sixty-fifth year of his age. Unremitting routine and other labors, and the enjoyment of many social meetings with friends, had somewhat abated both his physical and mental energies. Rest was desirable. Accompanied by his wife and daughter he visited Europe in the summer of 1889, but his first letters from London indicate that the sojourn there was much less cheering to him than it ever had been And then the serious illness of Mrs. Leidy, soon after reaching England, greatly augmented his depression, although the sympathy and attention of his English friends were unstinted. After her recovery the projected tour was completed, and in September all returned in better health and spirits than when they started on their trip to Europe.

Soon after reaching home a rumor from the University was a source of much distress to Dr. Leidy. It was said that the professorships were to be rearranged, and to realize the plan he would be asked to relinquish the Chair of Anatomy and retain his position in the Biological Department. A city newspaper reported substantially that Dr. Leidy had been requested to resign. The statement was at once authoritatively contradicted. Nevertheless, subsequently he, who was pronounced by one of the Faculty to be the "most consummate teacher that ever held the Chair of Anatomy," was requested to relinquish it, but he declined.

During the year 1890, in compliance with the wish of a valued friend, he visited several times the establishment of Mr. Keely, who claims that he had long ago discovered a new motor of extraordinary force. Diligent study during many years has failed to ascertain a practical method of applying this power to any use With this aim Mr. Keely has constructed costly and ingenious machinery which is set in motion by this occult power. Many prominent scientists, engineers and others have been invited at different times to inspect it, hoping probably that their opinions would encourage his continuous research. It seems, however—if the public be rightly informed in the premises—that, in their judgment, the nature of this new force, whatever it may be in fact, is not yet apparent. But Dr. Leidy wrote, December 18, on his card to a friend, "Keely appeared to me to have command of some power previously unknown."

This statement is not even presumptive testimony that a previously unknown natural force is now under command. Unsurpassed ability to ascertain the structure of organisms of every kind, as Dr. Leidy had, is not in itself sufficient to guarantee that the witness may not be deceived as to the motive force that operates complicated machinery, especially one who has never been interested in or studied any branch of physics. The judgment of a backwoodsman on the sea-worthiness and fighting qualities of the first battleship he ever visited would be as respectable.

His membership in many societies at home and abroad is significant of his widespread reputation. A list of them is appended

Prof Henry C. Chapman, of Jefferson Medical College, in his Memoir, printed in the Proceedings of the Academy of Natural Sciences of Philadelphia, for 1891, has noticed in a summary but admirable manner each of Dr. Leidy's leading publications. Lists of all of them may be found in the Appendix.

The general character of all his works is anatomical. They consist almost entirely of technical descriptions of genera and species of existing or extinct animals. Though highly creditable to their author, they interest very few persons besides votaries of natural history, because they are not applicable to any apparent industrial use Such writing does not bring pecuniary reward. With the exception of his books on Anatomy and reports to the Surgeon-General of the Army, he received no substantial compensation for any of his numerous essays.

Inasmuch as botany and mineralogy were greatly preferred to other branches of natural history in his early life, it is notable that he published little, if anything of importance, in connection with either.

Prof Thomas C Porter, of Lafayette College, among the foremost of our botanists, who was his intimate friend during many years, wrote in reply to inquiries · "To your other question I can give a definite answer. Of course, as a master of biology, he had a comprehensive knowledge of structural and physiological botany, but his interest in the plant world was only a side-interest. He had a fair acquaintance with our native flora, and his wonderful powers of observation were sometimes of great service to his friends who were engaged in its study. Had he turned his mind from animals to plants he would, no doubt, have done the same kind of valuable work amongst the latter as he had done amongst the former But I know of no thorough investigations of the sort made or published by him Looking over his species of Panicum one day, he remarked to me that, if he could devote the time to it, he should like to produce a monograph of that difficult genus He had a herbarium composed chiefly of specimens of his own collection It is not large, but like everything else which passed through his hands, in excellent condition "

In his charming personal history of Dr. Leidy, Dr William Hunt says: "I remember walking with him along the grassy path by the seaside at Bar Harbor one summer day We were on our way to visit a Philadelphia lady who was herself an amateur botanist, and particularly well

acquainted with the region about us. Suddenly Dr. Leidy said, raising his hands, 'Dear me! there is a plant which Gray says only grows high on the mountains, and here it is by the sea.' He gathered a portion of it with great care and put it in his pocket. When he got to the house he spoke of his find, and showed Mrs. —— the specimen. 'Why, Doctor,' she said, 'that is *Empetrum*.' The doctor looked carefully at it and said, 'Why, so it is; I thought it was *Loiseleuria*,' and laughed heartily, receiving the correction as though it had come from Gray himself."*

His deep interest in mineralogy was continuous from boyhood till the close of his life. To him it was a kind of Sunday afternoon or holiday recreation to visit friends who had cabinets, examine their newly acquired specimens, and talk about them in connection with those in rival collections. Always seeking to obtain rare specimens, especially of gems, he bought and sold and exchanged minerals with his friends whenever opportunity occurred. About the year 1870 he purchased a collection, said to be the finest ever brought from Europe to this country, and a year or two after sold it to a party in Boston for $2000, because he said he could not afford to keep it. He continually added to and improved his cabinet, which, at his death, was sold to the National Museum at Washington, D. C., for $2800.

He was not practically interested in the chemical analysis of minerals. But through his life-long habit of examining, comparing and exchanging specimens, as well as of buying and selling them, he acquired the skill of an average lapidary in recognizing mineral forms, especially of gems, and among his friends became an authority for their market value. Yet more than once he mistook an artificial for a real stone, submitted to his inspection by a dealer to test his knowledge.

Dr. Leidy had a broad chest and strong limbs, was about five feet ten or eleven inches in height and 200 pounds in weight. Relatively to his stature, slightly stooping at the shoulders, his head was rather small, and it was ascertained after death that his brain weighed forty five and a half ounces—somewhat less than the average. But deficiency of brain tissue was probably compensated for by the sustaining power of good blood-circulating and digestive apparatus, upon the normal functions of which mental activity in a degree depends. It is commonly known that a drink of tea or of any stimulant temporarily augments the activity of the mental machinery when it is moving slowly from fatigue or other cause. It is generally supposed, however, that intellectual energy is in proportion to the size of the brain, the prevailing weight of which in adult man is from forty-six to fifty-three ounces, according to an English authority,† and from forty-five to fifty five ounces among our own people, and among all races from two to four pounds, according to an American authority.‡

* In Memoriam. Dr Joseph Leidy, b Sept. 9, 1823, d. April 30, 1891. Personal History. By William Hunt, M.D. Read at the Academy of Natural Sciences, May 12, 1891.

† *Anatomy, Descriptive and Surgical.* By Henry Gray, F.R.S.

‡ *An Elementary Treatise on Human Anatomy.* By Joseph Leidy, M.D., LL.D., etc. Second edition, 1889.

"A little man with the same size of head as a big man will (other things being equal) possess more energy. In weight of brain, again, considerable differences exist among men of acknowledged power. The average weight of the male brain in civilized races is about 49 ounces. Cuvier's brain weighed 64 ounces; Abercrombie's and Schiller's, 63; De Morgan and Gauss, the mathematicians, 52¾ and 52 respectively. But Grote, the historian, had a brain only three-quarters of an ounce above the average, while the brains of Tiedemann, the anatomist, and Hausmann, the mineralogist, fell 5 and 6 ounces below it. * * *

"The heaviest known human brain belonged to a Sussex bricklayer, who died of consumption in University College Hospital in 1849. It exceeded 67 ounces and was well proportioned, while in physical size its owner was not greatly above the average, being 5 feet 9 inches in height and of robust frame. But the man could not read or write, though he was said to have a good memory and to be fond of politics."*

According to these data size or weight of brain is not a measure of mental capability.

Dr. Leidy had a handsome forehead, though it was not remarkably high nor broad. Compared with the head, his face was perhaps large. Nearly horizontal, straight brows slightly overhung tranquilly pensive blue eyes, which were not widely separated by a full sized, well-formed nose. His mouth, slightly drooping at the corners, contained a set of fine teeth. The lips were well proportioned and his chin was broad. He wore a full beard and was well crowned with fine hair. While conversing with friends the expression of his face was truly significant of his very amiable disposition. His utterance was distinct and the tone of his voice persuasive and pleasant, though slightly nasal. A natural and very modest demeanor made him welcome wherever he was. He loved the company of his friends. No member of either the Old Contributorship, of which he was a Director, or of the Biological Club, of which he was President, enjoyed more their stated dinners; on those occasions his cheerful and instructive conversation, almost always mentioning some fact new to them, gratified his companions.†

To him controversy and conflict were always repugnant. He preferred to yield at once, rather than contend. For him it was a task to say, No. This feature of his nature at times lessened his administrative efficiency in

He says, p. 713. "All other conditions being equal, it is observed also to hold a relation in size to the degree of mental development, hence the more civilized races and more cultivated and intelligent people are distinguished by a larger and heavier brain, while the opposite condition exists in the barbarous races and the least cultivated persons."

* *The Insanity of Genius, and the General Inequality of the Human Faculty, Physiologically Considered.* By J. F. Nisbet, author of *Marriage and Heredity*. Ward & Downey, 12 York street, Covent Garden, London, 1891.

† The Biological Club, as a token of its appreciation of Dr. Leidy, had painted a very satisfactory portrait of him, which is in the library of Academy of Natural Sciences.

The College of Physicians of Philadelphia has in its library a portrait, which is a lugubrious likeness, though artistically well painted.

the opinion of some of his warmest friends, and caused them on occasions to jocosely say: "Oh! he is an invertebrate"

While he was a bachelor his manner of living was properly economical, and his savings at different times amounted to considerable sums; but his financiering ability or forecast seemed to be limited to this kind of hoarding. At the time when speculation in petroleum was imagined to be a sure road to fortune, he listened to a friend supposed to be knowing in the field, invested in a petroleum company and lost $4000 On another occasion he was lured by promises to invest in a silver mine and lost about twice as much. Next he purchased stock of a certain railroad which from that day never made a dividend, and sold it for about half its cost.

During the first half of his life or more his attention was exclusively given to anatomical and natural history pursuits. General literature or popular diversions did not interest him in any considerable degree. His diary kept while in Europe in 1848 mentions that he once attended the Haymarket Theatre in London, and that he passed one evening in Paris at the Theatre du Palais Royal. But galleries of paintings and sculpture attracted his attention. To a friend who presented him a poem years ago he said "I never read poetry. It seems to me such a round-abound way of expressing ideas." And to another he said he did not understand how anybody could read "rhyming stuff." But in the last decade of life, when age and experience had tamed his energies, and egoism was less exacting, his tastes changed He read with pleasure certain poetic compositions, which friends commended, and now and then a novel Theatrical amusement often attracted him, and he was sometimes pleased to hear the music of his daughter's piano in the parlor while he was engaged in his study. He daily read newspapers, and, as a good citizen, voted at elections of city, State and United States officers.

In some respects he resembled Charles Darwin. Matthew Arnold says "Mr. Darwin once owned to a friend that, for his part, he did not experience the necessity of two things, which most men find so necessary to them—religion and poetry, science and the domestic affections he thought were enough."*

In his autobiography Mr Darwin says: "For many years I cannot endure to read a line of poetry; I have tried lately to read Shakespeare, and have found it so intolerably dull that it nauseated me. I have almost lost my taste for pictures and music. * * * My mind seems to have become a kind of machine for grinding general laws out of a large collection of facts."

Dr. Leidy, however, sought chiefly to ascertain facts; he did not attempt to deduce general laws from them.

He accepted, without reserve, all the theories of evolution, etc., of Mr. Darwin, with whom he had correspondence, but their religious views were very different.

* *Discourses in America.* By Matthew Arnold. Macmillan & Co., London, 1885, p. 111.

In a letter, dated February 28, 1879, addressed to his friend, the Rev Dr Henry C McCook, he said. "I mark what you say in reference to quoting from the *Cosmic Philosophy* of Prof. Fiske, instead of expressing my opinions in my own language I preferred doing so because my religious views so fully accord with those he so clearly presents to the reader. I have always had an antipathy to enter into a discussion of religious opinions, and when persons, curious to know mine, have questioned me, to avoid discussion, I have the last few years referred them to the admirable work of John Fiske

"While I am disposed to avoid public notice, I feel some recompense in your having read my note to your audience, as it may tend to remove the reproach of atheism, which you know is so unreasonably and freely imputed to all naturalists and philosophers

"Through life I have been conscious of having been a devoted worshiper (again to quote Mr Fiske) 'of an ever present God, without whom not a sparrow falls to the ground,' and I have often felt annoyed at the implied reproach of infidelity from the self sufficient who consider that they fulfill all religious duty in lip-service to the same Deity "

Though not a regular attendant of any church, he was pleased to listen occasionally to sermons of the Rev Drs. Phillips Brooks (Episcopalian), Ed. R Beadle (Presbyterian) and William H Furness (Unitarian) The teaching of the last was in accordance with his own religious views

The genius of Dr Leidy—an innate force that seems to dominate the exercise of the natural aptitudes or talents—a force none of his ancestors possessed, and is therefore not ascribable to heredity—impelled him to investigate natural objects and portray those which had not been previously described. His strong egoism was more gratified in this occupation than in any other Some of his contemporaries, who wrought in the same field, possibly may have done more, but in the accuracy of their work none surpassed him

Prof. Cesare Lombroso, of Turin, forcibly argues that genius of every kind is always associated with abnormal conditions of the organism, and for such reason its presence is significant of some degree or kind of degeneration * Dr Leidy was, as geniuses generally are said to be, precocious and sterile, also, emotional and so far, neuropathic During his visits to Europe, too long and too eager quest of whatever he sought was sometimes followed by a feverish state and an unpleasant degree of nervous depression; but perfect rest for a day, as his diaries show, enabled him to resume his pursuits.

Dr. Leidy had a rare experience of living nearly sixty eight years without provoking personal hostility, without making an enemy. Troops of friends encouraged his pursuits, and among them some were ever ready to give him, when needed, substantial help to publish his works. No votary of natural history was helped more or more favored or more popular.

*The Man of Genius By Cesare Lombroso, Professor of Legal Medicine at the University of Turin, with illustrations Walter Scott, 24 Warwick Lane, London, and Charles Scribner's Sons New York, 1891

Announcement of his death brought expressions of regret for the loss sustained and of admiration of his character from many citizens. Newspapers published sketches of his career and praised his works and ways.

The Alumni Society of the Medical Department of the University of Pennsylvania held its annual meeting in the evening of the same day. The President, Dr. Alfred Stillé, officially announced that Dr. Leidy had died in the morning, and said, among other things, that by the death of Dr. Leidy the University "looses the profoundest and most consummate teacher that ever held the Chair of Anatomy, and whose fame as a comparative anatomist, paleontologist, geologist, zoölogist and botanist was not bounded by his native city or country, but was coextensive with the civilized world.

"No man, who had such reason to be proud, was ever more humble. His simple and amiable manners attached to him the old as well as the young, and made him revered in the gravest circles of the learned and loved by the students, whom he inspired by his example and enriched by his knowledge."

The Wagner Free Institute of Science recorded its sense of loss in a minute, as follows:

"With feelings of deep sorrow we record the death of Dr. Joseph Leidy, who, for the past six years has stood at the head of the science work of our Institute as President of the Faculty and Director of the Museum.

"The death of this true and honest man, as gentle as he was strong, as humble as he was great, is to the whole civilized world, as it is to our own country, the loss of one of the most distinguished scientists of the day; while to Philadelphia, the city of his birth and life long home, it is the loss, not only of one of her greatest men, but as well of a true and faithful son, who loyally spent his whole life in her service, and who died, as he lived, in entire devotion to duty, wholly forgetful of himself, and mindful of the welfare of others.

"To the Wagner Free Institute of Science the loss occasioned by his death is beyond repair. The place he has left vacant cannot be filled. To him, more than any other man, and to his good guidance more than anything else, is due whatever has been accomplished by the Institute since the death of its founder, in the organization and conduct of its work in the cause of science. It is impossible to express in words the debt of gratitude we owe to him; only by deeds can we give expression to it, by striving to carry out the work which he has planned for us with such consummate skill, that it may become a living memorial of his earnest labors, his broad intelligence and his commanding knowledge."

And in the first paragraph of his Valedictory Address to the graduating classes in medicine and dentistry of the University, delivered at the annual commencement, May 1, 1891, Prof. James Tyson said: "The ink was scarcely dry on my page when came the intelligence that Joseph Leidy was seriously ill, and close on this fact of his death. This most

unexpected calamity has changed the present occasion from one of rejoicing to one of mourning—scarcely mitigated by the circumstance that Dr. Leidy died as he wished, after a short illness and with his shoulder, as it were, still at the wheel. For Dr. Leidy never ceased to work. His industry was only equaled by his intellect, and these by the sweet simplicity of his life. He loved science for science's sake, and neither poverty nor promise of riches, nor ambition, nor princely decoration could swerve him from his purpose. We are stupefied by the suddenness of our loss. And there is a fitness in the association of the end of your greatest teacher's life, and the new commencement of your own, which ought not to be without its effect in keeping green his precious memory, and in stimulating you to emulate his example "

The funeral services were at the First Unitarian Church, May 3. Members of the societies to which he belonged, the Faculties of the University, and prominent citizens in large numbers were present. The venerable and Rev. Dr Furness officiated, and delivered an eloquent and touching tribute to his worth.

His remains, and at the same time those of his brother, Dr Philip Leidy, who died April 29, were cremated, May 9

Not long afterwards representatives of the University solicited contributions to an endowment of $50,000 to be raised at once and exclusively devoted to the use of his widow; and ultimately revert to the University, "to establish and endow the *Leidy Memorial Museum* as an independent part of the great museum" projected for the Institution. Dr. Leidy bequeathed a modest sufficiency for his family. For such reason, probably, the necessity of the proposed endowment was not generally regarded to be urgent. About the same time it was decided to obtain an endowment for the Chair of Anatomy, the sum to be counted in the General Endowment Fund of $250,000 for the Medical Department, which, to make Dr. Pepper's conditional subscription of $50,000 payable, "must be secured before June 1, 1892, and then designate this chair by "the illustrious name of Leidy, whose labors gave it imperishable fame" "No more fitting memorial," says the circular, "can be found for this great man and beloved teacher." And the other circular says, "No memorial of Joseph Leidy can be more fitting than a museum in which will be garnered the infinite variety of natural objects which formed the basis of his admirable studies."

Prof. J. P Lesley, his personal and scientific friend, early in May published in the *Christian Register* a warm tribute to his worth and memory. He said among other statements "The eulogy of the dead runs easily into exaggeration. In this case that cannot happen. Rare men are so rare—a few in a generation, here and there one whose excellence is above degrees, the perfect man, the ideal man. He is like a statue set up in the public park of the metropolis, veiled until the day of showing comes. Death drops the veil, and the splendid apparition smites the heart of the community with a strange astonishment."

He also said, in substance, that while Cope and Marsh were working the fossiliferous field into which Dr. Leidy had entered long before, and by his labor made, in a sense, his own, they fell into disputes over priority of dates of different names of genera and species found in the later strata of a Western Territory, in which contention Leidy, the friend of both, refused to take any part. And, it seems proper to add, so dominant was his repugnance to controversy of every kind that he left his friends, freed from his participation, to compete with each other, and for a considerable period engaged in an entirely different field of investigation, to return long afterwards to his beloved paleontology.

The Trustees of the Building Fund of the Academy of Natural Sciences ordered, May 15, 1891, a memorial notice to be preserved with the record of their proceedings, in which it is stated that "his modest, amiable deportment at all times, his abiding interest in the welfare of the Academy and in the progress of the natural sciences, won for him the unreserved confidence and respect of his colleagues on the Board, and made his presence at its meetings always welcome. But his connection with the Trustees and his many official positions in the Academy could not add to the high estimation in which he was held in the community. His accurate and extensive knowledge of natural history in all its departments, his writings, his most acceptable teachings as Professor of Natural History in Swarthmore College, and as Professor of Human Anatomy in the University of Pennsylvania during more than a third of a century, from May, 1853, obtained for him a deserved reputation and fame among the friends of the Natural Sciences at home and abroad."

In his *Address to the Graduating Class of 1891, at Swarthmore College*, June 16, the President of the Board of Managers, Mr Joseph Wharton, said "And since nothing more potently aids us in the struggle to become wiser and better than observation of those who stand above us, and study of their methods, I can do nothing more fitting this occasion than endeavor to show you how this great man came to be so eminent, so trusted and so beloved.

"Joseph Leidy inherited excellent constitution of mind and body; he was transparently sincere and absolutely devoted to truth, he was remarkably devoid of selfishness in any form; he had persistent and life-long diligence; he was systematic in his expenditure and careful in his economy of time; he held firmly to whatever task he undertook; his temper was cheerfully equable and his disposition affectionate."

Commenting on each of these characteristics successively, in a lucid style, Mr. Wharton thus happily concludes his pleasing address: "If now I have succeeded in showing you that every part of Dr Leidy's great eminence grew out of the cultivation of such natural powers as your own, and out of the constant practice of such simple virtues as should also be yours, that, in a word, you may hope to scale such heights, to breathe such lofty air, to serve so well your kind, and to attain such universal respect and affection, without possessing other genius than that which has

been defined as 'an infinite capacity for taking pains,' and if in showing this I have stirred in you a secret resolution to make your lives bear some resemblance to his clean and fruitful life, my aim has been reached."

The tribute delivered at the opening session of the Congress of American Physicians, assembled at Washington, D. C., September 21, 1891, is the last. Dr. Pepper, the distinguished Provost of the University of Pennsylvania, said: "In the death of Joseph Leidy, which occurred April 30, 1891, at the age of sixty-eight years, the medical profession in America lost its most loved and honored member, and American science its most illustrious representative.* It makes a difference to the world when such a man passes away. At his birth Nature gave him her accolade, and all his life long he was loyal to the holy quest of truth, which is the vow imposed on those whom she invests as her chosen knights. Who can say how much of the marvelous and inexhaustible knowledge of nature this great man possessed came from the singleness of his life and the purity of his heart," etc., etc.

Leidy's life sustains rather Arthur Schopenhaur's opinion, that "thinkers and men of genius are those who have gone straight to the book of Nature; it is they who have enlightened the world and carried humanity further on its way."†

Postscript.—In the preparation of the preceding sketch, the writer has earnestly endeavored to avoid errors and hopes that he may have fairly succeeded. Incidents connected with the career of Dr. Leidy, though some of them may be unimportant or even trivial, have been narrated under an impression that they may assist in conveying a true representation of him.

The degree of usefulness to the world of his life-long work, according to the opinion that may be formed of it in the future, will be the criterion of its worth as well as the measure of the duration of his reputation.

* Knowing that Dr. Leidy had entirely ceased to practise medicine more than forty years before, a witty friend of the Provost, after reading his graceful eulogy, remarked in substance that it was like telling an assembly, representative of all the tanners of the United States that, in the death of General Grant, they had lost the most beloved member of the trade.

† November 17, 1891, Dr. William Hunt delivered an address on his University career before the alumni and students of the Medical Department of the University of Pennsylvania.

APPENDIX.

SOCIETIES AT HOME AND ABROAD OF WHICH DR. JOSEPH LEIDY WAS A MEMBER.

Boston Society of Natural History, 1845
Academy of Natural Sciences of Philadelphia, July 28, 1845.
Naturhistorischer Verein für das Grossherzogthum Hesse und Umgebung, 1848.
American Academy of Arts and Sciences, 1849.
American Philosophical Society, Oct., 1849.
Fellow of the College of Physicians of Philadelphia, 1851.
Philadelphia County Medical Society
Société de Biologie, Paris, 1851
Medical Society of Virginia, 1852.
Linnean Society of Pennsylvania College, Gettysburg, 1852.
Société Impériale de Naturalistes de Moscow, 1853.
Logan Institute, Virginia, 1853.
Zelosophical Society of the University of Pennsylvania, 1853.
Philomathian Society of the University of Pennsylvania, 1854.
Société des Sciences des Arts et des Lettres de Hainault, 1855.
Dallas Historical Society, 1855
Iowa Lyceum, Des Moines, 1855.
Natural History Society of Charleston, S. C., 1856
American Medical Association, 1856.
Academy of Sciences, St. Louis, Mo., 1856.
K. Leopoldinisch Carolinische Deutsche Akademie der Naturforscher, 1857.
Zoölogical Society of London, 1857
K. Baierische Akademie der Wissenschaften, 1858
Dublin University Zoölogical and Botanical Association, 1859
Burlington County [N. J.] Lyceum of History and Natural Science, 1859.
K. Böhmische Gesellschaft der Wissenschaften, 1860
R. Accademia economico-agraria dei Georgofili di Firenze, 1861.
K. K. Zoologisch-botanischer Verein, Wien, 1861.
Geological Society of London, 1861.
Dublin Natural History Society, 1862.
National Academy of Sciences [an original member], 1863
Minnesota Historical Society, 1863.
Entomological Society of Pennsylvania, 1864.
College of Physicians and Surgeons, Reading, 1870.
Alumni Society of the Medical Department of the University of Pennsylvania, 1871.
Anthropological Society of London, 1872.
Linnean Society of London, 1872
Minnesota Academy of Natural Science, 1873.
Société Nationale des Sciences Naturelles de Strasbourg, 1873.
Sociedad Mexicana de Historia Natural, 1874.
Zoölogical Society of Philadelphia, 1876.
Literary and Philosophical Society of Liverpool, 1877.
Historical Society of Pennsylvania, 1884.
Biological Society of Washington, D. C., 1884.
New York Microscopical Society, 1884.
K. Danske Videnskabernes Selskab, 1885.
Essex Institute, 1887.
Victoria Institute, or Philosophical Society of Great Britain, 1888.
Anthropometric Society, P.
Association of American Anatomists, P.

In all 50.

Dr. Leidy's Medical Papers and Books

The Medical Journal of the Medical Sciences

On Several Important Points in the Anatomy of the Human Larynx. Vol 12, pp 141-48, 1846

Researches into the Comparative Structure of the Liver Vol 15, pp 1[illegible]-[illegible], [illegible] plates, Jan, 1848.

On the Intimate Structure and History of the Articular Cartilages Vol 17, pp 277-94, 2 plates April, 1849

Intermaxillary Bone in the Embryo of the Human Subject Vol 17, p. 577, 1849, Also reported Jan 9 1849 in Proc Acad Nat Sci, Vol 4 pp. 145-47

Notice of Certain Bodies observed in the Human Subject Vol [illegible], pp [illegible], 1850

Human Anatomy By James Quain M D Edited by Richard Quain, F R S, and William Sharpey M D, F R S, Professor of Anatomy and Physiology in University College London First American from the Fifth London Edition Edited by Joseph Leidy M D In 2 Vols, with over 500 Illustrations Lea & Blanchard Philadelphia, 1849

Atlas of Pathological Histology By Gottlieb Gluge Professor of Physiology and Pathological Anatomy in the University of Bruxelles Member of the Royal Academy of Bruxelles Translated from the German by Joseph Leidy, M.D, Pathologist to St. Joseph's Hospital, Philadelphia, Fellow of the College of Physicians of Philadelphia Honorary Fellow of the Medical Society of Virginia Corresponding Member of the Biological Society of Paris, etc With 320 figures, plain and colored, on 12 copperplate engravings. Folio, pp 100. Blanchard & Lea, Philadelphia, 1853

The Medical and Surgical History of the War of the Rebellion Quarto. Part I, Vol 2, 1870 *Surgical History*

Report of Case of Gunshot Wound of the Cervical Vertebræ, with Autopsy and Specimen p 451 1864.

Gunshot Wound of Rib with Autopsy and Specimen p 569

Part II, Vol 2, 1876 *Surgical History*

Gunshot Flesh Wound, with Autopsy p. 450

Excision of Humerus necessary after Gunshot Wound, with Autopsy p 595

Gunshot Wound of Forearm with Autopsy and Specimen p 927

Specimen of Ulna successfully excised on Account of Gunshot Wound, with Report of the Case p. 984

Part II, Vol. I, 1879 *Medical History*

Reports of Cases and Autopsies made from July 30, 1862, to Oct. 26, 1864 pp 109-129, and subsequently p. 409, p. 518 and p. 541

Note.—Dr J Leidy's official communications to Surgeon-General Barnes embrace reports of more than sixty autopsies and cases.

An Elementary Treatise on Human Anatomy By Joseph Leidy, M D, Professor of Anatomy in the University of Pennsylvania, Curator of the Academy of Natural Sciences Member of the American Philosophical Society, American Academy of Arts and Sciences, Natural History Society, Boston, Lyceum of Natural History, New York, Elliot Natural History Society, Charleston, S. C, Medical Society of Virginia, Academy of Sciences of St. Louis, Imperial Society of Moscow, Royal Academy of Sciences, Munich, Imperial Leopold Carol. Academy of Sciences of Jena, Biological Society of Paris, Society of Arts and Sciences, Mons, Zoölogical Society, London, United Zoölogical and Botanical Association, Berlin, etc. With 392 Illustrations. J. B. Lippincott & Co, Philadelphia, 1861.

Intestinal Worms. 8vo, pp 938-944 incl., in Vol. 2 of A System of Practical Medicine. By American Authors. Edited by William Pepper, M D, LL D, etc.; assisted by Louis Starr, M D, etc Lea, Brothers & Co, Philadelphia, 1885

An Elementary Treatise on Human Anatomy. By Joseph Leidy, M D , LL.D , Professor of Human and Comparative Anatomy and Zoölogy in the University of Pennsylvania; President of the Academy of Natural Sciences, and of the Faculty of the Wagner Free Institute of Science. Second Edition, rewritten, with [illegible] illustrations. 8vo, pp. [illegible]. J. B. Lippincott Company, Philadelphia, [illegible].

DR. LEIDY'S BOOKS AND PAPERS ON NATURAL HISTORY

Anatomical Description of the Animal of Littorina angulifera. Illustrated. [Presented July 16, [illegible].] Boston Journal of Natural History, Vol. 5, pp. 314-17. Boston, 1847

On the Anatomy of the Animal of Helix albolabris, Say. Illustrated. Proceedings of the Boston Soc. Nat. Hist., Vol. 2, p. 57, [illegible].

On the Sack of the Dart, and of the Dart in Several Species of American Pneumobranchiate Mollusks. Proc. Boston Soc. Nat. Hist , Vol 2, pp. 59-60, 1845.

A Notice of Helix lithophaga, p. [illegible], Official Report of the United States Expedition to Explore the Dead Sea and River Jordan By Lieut. W F Lynch, U.S.N Published at the National Observatory, Washington. Quarto, printed in Baltimore, [illegible].

DR. LEIDY'S PAPERS PUBLISHED IN THE PROCEEDINGS OF THE AMER. PHILOS. SOC. OCTAVO

Verbal Remarks, March 4, 1859, on the Geology of the Headwaters of the Missouri. Vol. 7, p. 10.

A Biographical Notice of Isaac Lea, LL.D. Read Nov 18, 1887 Vol. 14, pp. [illegible].

DR. LEIDY'S PAPERS PUBLISHED IN THE TRANSACTIONS OF THE AMER PHILOS. SOC.

Vol. 10, New Series, Quarto, Published 1853

On the Organization of the Genus Gregarina of Dufour Read Jan. [illegible], 1851, pp. [illegible]-40, 2 plates.

Some Observations on Nematoidea imperfecta, and Description of Three Parasitic Infusoria. pp [illegible]-44, 1 plate.

Description of an Extinct Species of American Lion. Read May 7, 1852, pp. [illegible], 1 plate.

A Memoir on the Extinct Dicotylinæ of North America. Read May 21, 1852, pp. [illegible]-48, 4 plates.

In Vol. 11, New Series, Quarto, 1860:

Notice of the Remains of the Walrus discovered on the Coast of the United States. pp. [illegible].

Descriptions of the Remains of Fishes from the Carboniferous Limestone of Illinois and Missouri. Read July 15, 1854, pp. 87-90.

Bathygnathus and its Allies. Read Nov 21, [illegible], pp. 90-95.

Observations on the Extinct Peccary of North America, being a Sequel to a Memoir on the Extinct Dicotylinæ of America. Read Nov 21, 1856, pp 96-105.

Extinct Vertebrata from Judith River and Great Lignite Formations of Nebraska. pp [illegible]-54, plate.

UNITED STATES GEOLOGICAL SURVEY OF THE TERRITORIES.

Description of the Remains of Extinct Mammalia and Chelonia from Nebraska Territory, collected during the Geological Survey under the Direction of Dr. David Dale Owen. By Joseph Leidy, M D., of Philadelphia. Quarto. Pp. 540-[illegible] of the Report of the Geological Survey of Wisconsin, Iowa and Minnesota. By D. D Owen, under instructions of the U. S. Treasury Department. Lippincott, Grambo & Co., Philadelphia, [illegible].

Contributions to the Extinct Vertebrate Fauna of the Western Territories. By Prof. Joseph Leidy. Quarto, pp. [illegible], 37 plates. Being Vol. I of the Report of the United States Geological Survey of the Territories. By F V. Hayden, United States Geologist in Charge. In Five Volumes. Government Printing Press, Washington, 1873.

Freshwater Rhizopods of North America. By Joseph Leidy, M.D., Professor of Anatomy in the University of Pennsylvania, and of Natural History in Swarthmore College, Pennsylvania. Government Printing Office, Washington, 1879. Quarto, pp. 324+48 =372. Illustrated by six figures interpolated in the text, and 48 plates which contain 1150 figures of 61 genera and 94 species, of which Dr. Leidy originally described 22 species. All the figures were first drawn and colored by Dr Leidy, to be copied by artists.

JOURNAL OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA
Second Series. Quarto.

1 History and Anatomy of the Hemipterous Genus Belostoma. 2. Miscellanea Zoölogica. Vol. 1, pp. 5.–67 and 67-70, 1 plate, 1847
Descriptions of two species of Distoma, with the partial history of one of them. Vol. 1, pp. 301–309, 1 plate, 1850.
Descriptions of Some American Annelida abranchia. Vol. 2, pp. 43–50, 1 plate, 1850.
Description of a New Species of Crocodile from the Miocene of Virginia. Vol. 2, pp. 135–8, 1 plate, printed Dec. 1851.
On the Osteology of the Head of Hippopotamus, and a Description of the Osteological Characters of a New Genus of Hippopotamidæ. Vol 2, pp. 207–24, 1 plate, 1852.
On Bathygnathus borealis, an Extinct Saurian of the New Red Sandstone of Prince Edward's Island Vol. 2, pp 327–30, 1 plate, 1854.
Contributions towards a Knowledge of the Marine Invertebrate Fauna of the Coasts of Rhode Island and New Jersey. Vol. 3, pp. 135–152, 2 plates, 1855.
Descriptions of Some Remains of Fishes from the Carboniferous and Devonian Formations of the United States Vol. 3, pp 159–65, 1 plate, 1856.
Descriptions of Some Extinct Mammalia. Vol. 3, pp. 165–71, 2 plates, 1856.

The Extinct Mammalian Fauna of Dakota and Nebraska. Including an Account of Some Allied Forms from Other Localities, together with a Synopsis of the Mammalian Remains of North America. Illustrated with 30 plates. Preceded, with an Introduction on the Geology of the Tertiary Formations of Dakota and Nebraska, accompanied with a Map By F V. Hayden, M D, Professor of Mineralogy and Geology in the Univ of Pa., U S. Geologist, etc., etc. Vol. 7, pp. 472, 1869.

NOTE.—The authors of the above-named work were enabled to execute it chiefly through the generosity of Messrs. Joseph Jeanes and William P Wilstach, to whom, as well as to some others, they acknowledge indebtedness.

Description of Vertebrate Remains chiefly from the Phosphate Beds of South Carolina Vol. 8, pp. 209–61, 5 plates, 1874–81
Parasites of the Termites. Vol. 8, pp. 425–47, 2 plates, 1874–81.
Remarks on Bathygnathus borealis. Vol. 8, pp. 449–51.
Urnatella gracilis, a Fresh-water Polyzoan. Vol. 9, pp. 5–16, 1 plate, 1884.

SMITHSONIAN CONTRIBUTIONS TO KNOWLEDGE.
Quarto.

A Flora and Fauna within Living Animals. (Accepted for publication 1851.) Vol. 5, pp. 68, 10 plates, 1853.
Memoir on the Extinct Species of Fossil Ox. (Accepted for publication 1852) Vol. 5, pp. 20, 5 plates, 1852.
The Ancient Fauna of Nebraska; or a Description of Extinct Mammalia and Chelonia from the Mauvaises terres of Nebraska. (Accepted for publication 1852.) Vol. 6, pp. 126, 25 plates, 1854
A Memoir on the Extinct Sloth Tribe of North America. (Accepted for publication Dec., 1853; published June, 1855.) Vol. 7, 1855, pp. 70, 16 plates.
Cretaceous Reptiles of the United States. (Accepted for publication Dec., 1864.) Vol. 14, 1865, pp. 140, 20 plates.

ANNUAL REPORTS OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION

Brief Review of a Memoir on the Cretaceous Reptiles of the United States, published in the Fourteenth Volume of the Smithsonian Contributions to Knowledge. By the Author, Joseph Leidy, M.D. 8vo, pp. 68–72. *For the year 1864.* Washington D C, 1865.

WRITTEN AND VERBAL COMMUNICATIONS BY DR. JOSEPH LEIDY PUBLISHED IN THE PROCEEDINGS OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

1845.

Notes taken on a Visit to White Pond, Warren Co., N J, and a List of Ten Species of Fossil Shells collected there. Vol 2, p. 279.

Verbal, Nov. 18, That his microscopic observation of a portion of a vertebra of the Fossil Zeuglodon shows that it has all the characteristics of recent bone. Vol. 2, p. 324.

1846.

Remarks on the Anatomy of the Abdominal Viscera of the Sloth, Bradypus tridactylus Vol. 3, pp. 72–4, 2 figures.

On the Anatomy of Spectrum femoratum, Say Vol. 3, pp 80–4 Illustrated by 18 figures on 2 plates.

On the mechanism which closes the membranous wings of the genus Locusta. Vol. 3, p 104, 1 fig.

Descriptions of a new genus and species of Entozoa, Cryptobia helicis. Vol. 3, p 100, 1 fig. [Finding that this name, Cryptobia, had been previously appropriated he changed it, August, 1847, to Cryptoicus.]

Verbal, Oct. 6, notice that he had lately detected an Entozoön (*Trichina spiralis*) in the superficial part of the extensor muscle of the thigh of a hog Vol. 3, pp 107–8.

On the Situation of the Olfactory Sense in the Terrestrial Tribe of Gasteropodous Mollusca. Vol 3, pp. 136–7

Verbal, April 15, remarks on the great fecundity of the Cryptogamia indicated in a specimen Puffball. Vol. 3, p. 135.

1847.

Verbal, May 4, statement that he has observed numerous polygonal crystals, supposed to be oxalate of lime, in the cellular structure of several species of Parmelia. Vol 3, p. 210.

Verbal, June 8, notice of the remains of sutures of the incisive bone distinctly traceable in the cranium of a New Hollander, then exhibited. Vol 3, p. 217

Verbal, June 22, description of Distoma helicis, an Entozoön found in the pericardium of *Helix alternata.* Vol 3, p. 220.

Verbal, Aug. 24, remarks on the teeth of the specimen of Squatina Dumerili exhibited. Vol. 3, p. 247

Description and Anatomy of a New and Curious Subgenus Planaria. Vol. 3, pp. 248–51

Description of two new species of Planaria. Vol 3, pp. 251–2.

On the Fossil Horse of America. Vol. 3, p 262, 1 plate, 6 figs.

Verbal, Nov. 9, remarks on the slow destructibility of Animal Tissues in certain states Vol. 3, p. 315.

On a new genus and species of Ruminantia, Poebrotherium Wilsonii. Vol. 3, pp. 322–6, 1 plate, 6 figs.

Verbal, Dec. 14, observations, in addition, on the Fossil Horse Vol 3, p. 328.

1848.

Verbal, Jan. 11, notice that he had found an eye in Balanus rugosus, heretofore admitted to exist only in the larva or imperfect stage of the Cirrhopoda. Vol. 4, p. 1

Verbal, Feb. 15, notice of the Hair of a Hottentot boy Vol 4, p. 7

On some Peculiar Bodies in the Boa constrictor, resembling Pacinian Bodies. Vol. 4, pp 27–8, 4 figs.

A new fossil genus and species of ruminantoid pachydermata, Merycoidodon Culbertsonii. Vol 4, pp. 47–50, 5 figs.

Verbal, Dec. 5, remarks on the development of the Purkenjean Corpuscle in bone, the intimate structure of cartilage, and on the arrangement of the areolar sheath of muscular fasciculi and its relations to the tendon. Vol. 4, pp. 136–38.

1849.

Verbal, Jan 9, remarks on the existence of the intermaxillary bone in the embryo of the human subject. Vol. 4, pp 145–7, 2 figs

Remarks on fragments of the fossil Tapir deposited in the Academy Vol. 4, pp. 180–2

Remarks on species of Confervaceae, on a new genus of Enterobrus elegans, Cladophytum, a new genus of Entophyta; Cladophytum comatum, Arthromitus (a second new genus); new Genera of Entozoa. Vol. 4, pp. 225–33.

On the Existence of Entophyta in Healthy Animals, as a Natural Condition Vol. 4, pp. 225–33.

Observations on the Character and Intimate Structure of the Odoriferous Glands of the Invertebrata. Vol. 4, p. 234–6, 6 figs.

New genus and species of Entophyta. Vol. 4, pp. 249–50.

1850.

Remarks on Entophyta. Vol. 5, pp. 7–8.

Verbal, April 9, that he had observed in the stomach of the larva of Arctia isabella that the nucleus of every epithelial cell contained an octahedral crystal, the axis of which measured about 1.37500th of an inch, etc., etc. Vol 5, p. 32.

On Crystalline Bodies in the tissues of plants. Vol. 5, pp. 32–3.

On Rhinoceros occidentalis. Vol. 5, p. 119.

Descriptions of new Entophyta growing within Animals. Vol. 5, p. 35.

Eucrotaphus Jacksoni, and Archaeotherium Mortoni, from Fragments of Crania found in Cumberland Co., Pa. Vol. 5, pp. 90–3.

Contributions to Helminthology Vol. 5, pp 96–8.

Notes on the Development of the Gordius aquaticus. Vol. 5, pp. 98–100.

Two New Species of Infusorial Entozoa. Vol 5, p. 100.

Descriptions of some Nematoid Entozoa infesting Insects. Vol. 5, pp. 100–102.

Descriptions of Three Filariae. Vol. 5, pp 117–8.

Remarks on the Nettling Organs of the Hydra. Vol. 5, pp. 119–121.

On some fossil mammalian remains Rhinoceros Nebrascensis, Palaeotherium Bairdii, Merycoidodon Culbertsonii and Agriochoerus antiquus. Vol. 5, pp 121–2.

Descriptions of New Genera of Vermes. Vol. 5, pp. 124–6.

1851.

Descriptions of New Species of Entozoa. Vol. 5, p. 155.

On Some Fragments of Palaeotherium Proutii. Vol 5, pp. 170–1.

Fossil Tortoise, Stylemys Nebrascensis. Vol 5, p. 172.

Testudo lata—Emys hemispherica. Vol. 5 p. 173.

On the Fungus Disease of Cicada septendecem. Vol 5, p. 235.

Verbal, May 6, on transplanting cancer. Vol. 5, p. 201

Verbal, May 13, that he had found a dead Male Cricket (Grillo talpa Americana), perfect in all its parts, the body of which was everywhere filled with a parasitic fungus, the elliptical or globular sporules of which averaged 1.2500th of an inch in diameter. Vol. 5, p. 204.

Contributions to Helminthology Vol. 5, pp. 205–9.

Helminthological Contributions, No 2. Vol 5, pp. 224–7

Remarks on Fragments of fossil ruminant ungulates. Vol. 5, p. 237–8.

Helminthological Contributions, No. 3. Vol. 5, p. 239–44.

Plumatella diffusa, a branching fresh-water ciliated Polyp. Vol. 5, pp. 261–2.

Description of Cristatella magnifica. Vol. 5, p. 265.

Description of Spongilla fragilis. Vol. 5, p. 278.

Corrections and additions to former papers on Helminthology Vol. 5, pp. 284–90.

Verbal, Nov 4, that he had examined the fossil saurian bones presented by Mr. Nash, and found that they belong to a new species of Crocodile which he had named Crocodilus antiquus. Vol. 5, p 287.

Descriptions of Balæna palæatlantica and Balæna prisca, Leidy, based on fragments of fossil bones from the Miocene formation of Virginia. Vol. 5, pp. 308-9.

On some American fresh-water Polyzoa. Vol 5, pp. 320-2, 1 plate with 5 figs.

Verbal, on fossil reptilian and mammalian remains found in the green sand of New Jersey Cimoliasaurus magnus, Discosaurus vetustus; Priscodelphinus Harlani Priscodelphinus grandævus, Crocodilus fastigiatus, Emys Owenii, all Leidy. Vol. 5, p. 325-6.

Fossils from the Green Sand of New Jersey, named Chelonia grandæva; Trionyx priscus, Machairodus primævus, Leidy. Vol. 5, pp. 329-30.

Contributions to Helminthology. Vol. 5, pp. 349-51

1852.

Verbal, Jan. 6, remarks on Rhinoceros Americanus, named from fragments of fossil bones collected in Nebraska Vol. 6, p. 2.

Verbal, Jan. 13, that the Cetacean remains, which he had named Priscodelphinus, are the first relics of mammals found in the Cretaceous group. Vol. 6, p. 4.

Verbal, Feb. 10, on Emys Culbertsonii, a new species. Vol. 6, p. 34.

Verbal, Feb. 17, on Delphinus Conradi, and a new genus and species, Thoracosaurus grandis. Vol. 6, p. 35.

Verbal, March 2, on Pontogeneus priscus. Vol 6, p. 52.

Verbal, March 16, Pointing out that heads of the Hippopotamus from N W. Africa differ from those from Southern Africa. Vol. 6, p. 54.

Verbal, March 23, on a fine skeleton of Troglodytes Gorilla, presented by Dr Henry A. Ford of Liberia. Vol 6, p. 55.

On Fossil Tortoises from Nebraska. Vol. 6, p. 59.

Verbal, May 4, notice of an extinct species of Ox, and Bootherium. Vol. 6, p. 71.

On the Red Snow of the Arctic Regions. Vol. 6, p. 59

On the Honey Ant of Mexico. Vol. 6, p. 72.

Remarks on various fossil teeth Vol. 6, p. 241.

On some fossil fragments from Natchez. Vol. 6, p 303.

Verbal, July 6, remarks on Bison latifrons (Leidy) and B antiquus Leidy, and on several species of Megalonyx (3 Leidy). Vol. 6, p. 117

1853.

Verbal, March 8, notice of three species of fossil Ursus. Vol. 6, p. 303.

Verbal, Aug. 2, remarks on Cetacean fossil bones in the green sand of N. J, and on Cetacean fossils from other localities. Vol. 6, p. 377.

Verbal, Nov 1, notice of fishes being infested with a parasitic worm of the genus Distoma. Vol. 6, p. 433.

Remarks on a collection of fossil mammalia and chelonia from the Mauvaises Terres of Nebraska. Vol. 6, pp. 392-4.

1854.

Verbal, May 23, account of fossil vertebræ of extinct saurians, which he named Brimosaurus grandis and Cimoliasaurus magnus, illustrated by 6 figs. on a plate. Vol. 7, p. 72.

Verbal, June 6, on Bison latifrons, Arctodus pristinus, Hippodon speciosus and Merycodus necatus. Vol 7, pp. 89-90.

Synopsis of Extinct Mammalia from Nebraska. Vol. 7, pp. 156-7

On Dinictis felina. Vol. 7, p. 127.

On Hydrachna. Vol. 7, p. 204

Description of a fossil apparently Indicating an extinct Species of the Camel Tribe. Vol. 7, pp. 172-3.

On Urnatella gracilis and a New Species of Plumatella. Vol. 7, pp. 191-2.

Notice of some Fossil Bones Discovered by Mr Francis A. Lincke in the Banks of the Ohio River Vol 7, pp. 199-201

Remarks on the question of the identity of Bootherium cavifrons with Ovibos moschatus, or O maximus. Vol. 7, pp. 209-10.

1855.

On a so-called Fossil Man. Vol. 7, p. 84.

Indications of twelve species of Fossil Fishes. Vol. 7, pp. 395-7

Indications of five species with two new genera of Extinct Fishes. Vol 7, p. 414.

Notices of some Tape Worms. Vol. 7, pp. 443-4

1856.

Verbal, Jan. 15, on Filaria canis cordis filling the right auricle and right ventricle of the heart of a dog, which was exhibited. Vol. 8, p 2.

Description of two Ichthyodorulites. Vol. 8, pp. 11-2.

Synopsis of Entozoa and some of their Ecto-congeners, observed by the Author. Vol 8, pp. 42-58.

Notices of some Remains of Extinct Mammalia recently discovered by Dr F V Hayden in the Bad Lands of Nebraska. Vol 8, p. 59.

Notices of Extinct Reptiles and Fishes, discovered by Dr. F V Hayden in the Bad Lands of Judith River, Nebraska Territory Vol. 8, pp. 72-4.

Notices of Remains of Extinct Mammalia, discovered by Dr F V Hayden in Nebraska Territory Vol 8, pp 90-1

Notice of the Remains of a species of Seal from the postpliocene deposit of the Ottowa River Vol. 8, pp. 90-1, with a plate.

Notices of several genera of Extinct Mammalia previously less perfectly characterized. Vol 8, pp. 91-2

Verbal, Sept. 16, in reference to the color of the eyes of Platyphyllum concavum (Katydid) being greenish by day and cherry red at night. Vol. 8, p. 162.

Verbal, Sept. 16, that oyster and clam shells are perforated by a sponge of the genus Cliona Vol. 8, p. 162-3.

Notice of some remains of Extinct Vertebrated Animals Vol. 8, pp 163-5.

Notices of remains of extinct vertebrated animals of New Jersey, collected by Prof Cook of the State Geological Survey, under the direction of Dr W Kitchell. Vol 8, pp. 220-1

Notices of remains of extinct vertebrated animals discovered by Prof. E. Emmons. Vol. 8, pp. 255-6.

Notice of some Remains of Fishes discovered by Dr John E. Evans. Vol. 8, pp. 256-7.

Notice of Remains of two species of Seal Vol. 8, p. 265.

Remarks on certain extinct species of Fishes. Vol. 8, pp. 301-2

Notices of remains of extinct turtles of New Jersey, collected by Prof Cook, of the State Geological Survey, under the direction of Dr W Kitchell. Vol. 8, pp. 303-4

Notices of Extinct Vertebrata discovered by Dr F V Hayden during the Expedition to the Sioux Country under the Command of Lieut. G K. Warren Vol 8, pp. 311-2.

1857.

List of Extinct Vertebrata, the Remains of which have been discovered in the Region of the Missouri River; with Remarks on their Geological Age. Vol. 9, pp. 89-91.

Notices of some Remains of Extinct Fishes. Vol. 9, pp. 167-8.

Rectification of the References of certain of the extinct mammalian genera of Nebraska. Vol. 9, p. 175

Verbal, Dec. 1, on a large species of Gordius and a larva of Oestrus. Vol. 8, p 204.

Verbal, Feb. 17, observations on Entozoa found in the Naiades Vol 9, p. 18.

Verbal, June 2, on Coprolites and Shales with Posidoniae. Vol. 9, p. 149

Verbal, June 16, on the new red sandstone fossils from the Gwynned tunnel North Pa. R. R. Vol. 9, p. 150.

Verbal, Sept. 1, on the dentition of Mosasaurus; also on Oecanthus. Vol. 9, pp. 176-7

Verbal, Dec 22, on a curious animalcule found on stones and dead plants in the Schuylkill and Delaware rivers Vol 9, p 204.

Verbal, Dec. 29, observations on the introduction of camel into North America. Vol 9, p. 210.

1858.

Verbal, Jan 12, that the stomachs of Urnatella gracilis contained voluntary moving bodies, which might prove to be generative bodies Vol 10, p 1.

Verbal, Jan 19, that the extinct camel seemed to be about two thirds the size of the recent species. Vol 10, p 2.

Verbal, Feb. 2, that the fossil remains from the Niobrara river belong to some twenty or more species which are distinct from those found in the Miocene of the Mauvaises Terres, as well as from those of a subsequent age. Vol 10, p. 7

Verbal, March 2, that with the collection of fossils received from the vicinity of Kansas river, were several masses of a yellowish magnesian limestone containing numerous casts of a very peculiar group of fossils, that among the specimens found in the valley of the Niobrara river, Nebraska, is the lower jaw of a new species of Mastodon Vol 10, p 10.

Verbal, March 9, that after inspecting numerous equine remains from Niobrara, he inclines to believe that the remains of the horse found in the Postpliocene deposits of the United States indicate two species. Vol 10, p. 11

Notices of remains of Extinct Vertebrata from the valley of the Niobrara River, collected during the Exploring Expedition of 1857, in Nebraska, under the command of Lieut C K. Warren, U S Top Eng, by Dr. F V Hayden, Geologist to the Expedition Vol. 10, pp 20-9.

Verbal, April 6, that in the collection from Niobrara two additional species of the ancient camel are indicated Procamelus robustus and P gracilis. He mentioned that fractured fossils are best mended by saturating them with melted beeswax Vol 10, p 69

Verbal, April 13, that he had named a fresh water worm which lives in tubes of mud Manayunkia speciosa. Vol 10, p. 90.

Contributions to Helminthology Vol. 10 pp. 110-2.

Verbal, June 29, that one-half of the chrysalides of the canker-worm were infested by two species of Ichneumon. Vol. 10, p. 187.

Verbal, Nov 2, that he and Dr Bridges, in Lily pond, near Newport, R I, had found a species of Cristatella. Vol 10, pp. 188-90

Verbal, Dec. 14, that the fossil bones obtained from Haddonfield, N J, and given to him by Mr Foulke for description, belonged to a huge extinct herbivorous Saurian, which he named Hadrosaurus Foulkii Vol 10, pp 215-6.

1859.

Verbal, Jan. 11, that he had found the Manayunkia speciosa (a curious fresh-water worm, a drawing of which he exhibited) in great abundance at the foot of the cliffs washed by the ocean near Newport, R. I Vol. 11, p. 2.

Verbal, Jan. 18, that from fossil remains of cartilaginous fishes, found in the carboniferous formations of Kansas, he had made three species. Vol. 11, p 3.

Verbal, March 29, remarks on a Mastodon tooth from Tambla, Honduras, and teeth and fragments of teeth of Mosasaurus from the green sand of New Jersey Vol. 11, p 91

Verbal, April 12, in reference to ferruginous rock containing remains of fishes. Vol. 11, p. 110.

Verbal, April 19, in reference to fossil bones contained in so-called guano from Sombrero, W I., which were exhibited. Vol. 11, p. 111.

Verbal, May 17, on specimens of Paleotrochus from subsilurian strata, which he considered fossil, though its organic nature had been denied Vol. 11, p 159.

Verbal, Aug. 23, remarks on an antler of a reindeer, and on an animalcule a drawing of which was submitted, found at Newport, R. I, named Freyia Americana. Vol. 11, p. 194.

1860.

Verbal, Feb. 21, that Albertite is a product from the distillation of bituminous coals or shales, and is perfectly amorphous. Vol. 12, p. 54.

Verbal, March 13, on Hyalonema from Japan. Vol. 12, p. 85.

Verbal, April 3, that experiments with Trichina spiralis, by Prof. Leuckart, of Giessen, imply that the animal finds its way into the human body through food or drink. Vol. 12, p. 96.

Verbal, July 24, notice of a specimen of Hyla. Vol. 12, p. 305.

Verbal, Oct. 9, that the specimens of fossil bones from Washington Co., Texas, indicated a new equine genus, and a species of Hippotherium. Vol. 12, p. 416.

Verbal, Oct. 16, notice of an extinct Peccary. Vol. 12, p. 418.

1861.

Verbal, April 16, that lignite had been discovered at the border of the new red sandstone on Plymouth creek, near Norristown, Pa. Vol. 13, p. 77

1862.

Verbal, Nov. 18, that he had noticed a boulder, apparently of Potsdam sandstone, at the corner of Thirty-seventh and Market streets, exposed by digging gravel, which is the largest transported block he had observed in our vicinity. Vol. 14, p. 507

1863.

Verbal, Sept. 15, that he had found a Phalangopsis rolled in a leaf of a spice bush. Vol. 15, p. 212.

Verbal, Nov. 3, on specimens of Nostoc pruniforme. Vol. 15, p. 231.

1865.

Verbal, May 23, that a boring sponge existed during the Cretaceous period. Vol. 17, p. 77

Verbal, June 6, that fossil remains of horses had been found throughout the length and breadth of the North American continent. Vol. 17, p. 94.

Verbal, June 20, that he had found at Cape Henlopen, in a kitchen refuse heap, a clay pipe. Vol. 17, p. 95.

Verbal, Sept. 5, remarks on a foetal dog-shark. Vol. 17, p. 175.

Verbal, Sept. 19, in reference to fossil bones of Rhinoceros. Vol. 17, p. 176.

Verbal, Oct. 10, remarks on specimens of oolitic phosphates of lime and alumina; also on human bones from a guano deposit on the Island Orchilla, W. I. Vol. 17, p. 181.

1866.

Verbal, Jan. 2, on part of a human skull of the so-called pigmy race, from near the mouth of Stone river, Tennessee. Vol. 18, p. 1.

Verbal, March 20, on a large phalanx of an extinct reptile; and stated that he was the first to discover the Trichina spiralis in the hog (while eating a slice of pork, he noticed some minute specks which recalled to mind the Trichina spots seen in the muscles of a human subject only a few days previously). Vol. 18, p. 9.

Verbal, May 22, that in the salt mine of the Island of Petite Anse, La., were grains of precious garnet, olivine, bones of the elephant, etc. Vol. 18, p. 109.

Verbal, June 5, in reference to a small collection of fossils from Bangor, Maine. Vol. 18, p. 157

Verbal, Oct. 23, in reference to molar teeth of Mastodon ohioticus. Vol. 18, p. 290.

Verbal, Dec. 4, in reference to Drepanodon or Machairodus occidentalis, fragments of bones of which were shown. Vol. 18, p. 345.

1867.

Verbal, June 25, in reference to Bison antiquus. Vol. 19, p. 85.

Verbal, Sept. 10, on a fossil skull of Geomys bursarius. Vol. 19, p. 97.

Verbal, Sept. 17, on a fossil skull of Castoroides ohioensis. Vol. 19, p. 97.

Verbal, Oct. 1, in reference to specimens of black beryl was exhibited. Vol. 19, p. 125.

1868.

Verbal, June 2, that some Sombrero guano contains ninety per cent. of phosphate of lime. Vol. 20, p. 156.
Notice of some Vertebrate Remains from Harden County, Texas. Vol. 20, pp. 174-6.
Indications of an Elotherium in California. Vol. 20, p. 177.
Notice of some Reptilian Remains from Nevada. Vol. 20, pp. 177-8.
Notice of some Vertebrate Remains from the West Indian Islands. Vol. 20, pp. 178-80.
Notice of some Remains of Horses. Vol. 20, p. 195.
Notice of some Extinct Cetaceans. Vol. 20, pp. 196-7.
Remarks on a Jaw fragment of Megalosaurus. Vol. 20, pp. 197-200.
Remarks on Conosaurus of Gibbes. Vol. 20, pp. 200-2.
Notice of American species Ptychodus. Vol. 20, pp. 205-8.
Verbal, Oct. 20, that he found the stomach of a shad full of small fishes. Vol. 20, p. 228.
Notice of some American Leeches. Vol. 20, 229-30.
Notice of the remains of extinct Pachyderms. Vol. 20, pp. 230-3.
Verbal, Nov. 3, in reference to specimens seemingly of coprolites from the Huronian slates. Vol. 20, pp. 308-9.
Verbal, Nov. 3, that iridescence in opals is caused by striæ, 4000 to the inch. Vol. 20, p. 309.
Verbal, Dec. 1, on asterism in mica. Vol. 20, p. 313.
Notice of some remains of extinct Insectivora. Vol. 20, p. 315.

1869.

Notice of some extinct vertebrates from Wyoming and Dakota. Vol. 21, pp. 63-7.

1870.

Verbal, Jan. 4, description of Megacerops Coloradensis. Vol. 22, pp. 1, 2.
Verbal, Jan. 11, remarks on Poicilopleuron and other fossils submitted for examination by Prof. Hayden. Vol. 22, pp. 3-5.
Verbal, March 1, remarks on the right humerus of one of the extinct giant sloths resembling Mylodon robustus, and on Dromotherium sylvestre, submitted for examination by the Smithsonian Institution. Vol. 22, pp. 8, 9.
Verbal, March 8, remarks on reptilian remains from the Cretaceous formation near Fort Wallace, Kansas, described by Prof. Cope under the name of Elasmosaurus platyurus. Vol. 22, p. 9.
Verbal, March 22, observations on ichthyodorulites, of which specimens were shown, on a metacarpal bone of Megalonyx Jeffersoni, and on a last lower grinder of Bison antiquus. Vol. 22, pp. 12-3.
Verbal, April 5, remarks on Discosaurus and its allies. Vol. 22, pp. 18-22.
Verbal, May 3, description of the internal generative organs of a hog, which were exhibited. Vol. 22, p. 65.
Verbal, May 17, remarks on some fossil bones from the Pliocene formation in the Mauvaises Terres of Dakota, which were shown. Vol. 22, pp. 65-6.
Verbal, June 14, observations on mammalian fossil remains, submitted for examination, from Idaho, from Utah, and from Oregon; also, on Hadrosaurus and its allies. Vol. 22, pp. 66-9.
Verbal, June 21, notice of two fossil fragments belonging to Bison americanus and Elephas americanus. Vol. 22, pp. 69-71.
Verbal, July 5, remarks on differences between animals of the same species inhabiting Europe and America. Vol. 22, p. 72.
Verbal, July 12, remarks on a mutilated portion of the lower jaw of a large ruminant supposed to belong to Ovibos cavifrons. Vol. 22, p. 73.
Verbal, July 19, observations on a fossil, which he exhibited and named Nothosaurus occiduus. Vol. 22, p. 74.
Verbal, Aug. 2, description of Nephelis punctata, a new leech. Vol. 22, pp. 89-90.

Verbal, Sept. 20, account of a fossil crocodile, which he named Crocodilus Elliotti; remarks on Urnatella and Manayunkia. Vol. 22, pp. 106-8.

Verbal, Oct. 4, reference to a small collection of fossils from Wyoming, most of which pertain to Merycochœrus. Vol. 24, pp. 109-10.

Verbal, Oct. 18, remarks on some fossil remains which belong to Oreodon. Vol. 22, pp. 111-2.

Verbal, Oct. 25, observations in reference to several boxes of fossils from Fort Bridger, among which were Microsus cuspidatus and Notharctus tenebrosus, etc. Vol. 22, p 113.

Verbal, Nov 1, notice of Graphiodon vinearius. Vol. 22, p. 122.

Verbal, Nov 8, descriptions of fossil species Emys Jeanesi, Emys Haydeni, Baena arenosa, Saniwa ensidens. Vol. 22, pp. 123-4.

Verbal, Nov 15, observations on fossils submitted for examination by Prof. J. D. Whitney, among which are fragments representative of the llama, camel, Hipparion and Protohippus. Vol. 22, pp. 125-7.

1871.

Verbal, Feb. 6, remarks on fossil bones from California. Vol. 23, p. 50.

Verbal, March 21, notice of Tænia canaliata. Vol 23, p. 58.

Verbal, April 18, observations on extinct turtles from Wyoming. Vol. 23, p. 102.

Verbal, May 9, remarks on polydactylism in a horse. Vol 24, p. 112.

Verbal, May 16, observations on some fossil remains of Mastodon and horse in North Carolina; and of mammals from Wyoming. Vol. 23, pp. 113-4.

Verbal, June 5, on fossil Testudo of Wyoming, on supposed fossil turtle eggs, and on garnets from Green's creek, Delaware Co., Pa. Vol 23, pp. 151-5.

Verbal, July 4, on some fossils from Fort Bridger. Vol. 23, p. 167

Verbal, Aug. 1, on Mastodon remains from California, on Anchitherium. Vol. 23, pp. 198-9.

Verbal, Aug. 8, on fossil vertebrates from Wyoming. Vol. 23, pp. 228-9.

Verbal, Aug. 29, on extinct Rodents. Vol. 23, pp. 130-2.

Verbal, Oct. 10, on the minerals of Mount Mica. Vol. 23, pp. 245-7.

Verbal, Oct. 17, on fossils from Oregon. Vol. 23, pp. 247-8.

Verbal, Nov 21, on the communication of contagion by flies. Vol. 23, p. 297

Verbal, Dec. 12, on several worms. Vol. 23, pp. 305-7.

1872.

Verbal, Jan. 2, that Dr. C S. Turnbull had found a mite on the membrana tympani of an ox. Vol. 24, p. 9. Named Gamasus auris, p 136.

Verbal, Feb. 4, notices of Corundum, and of fossils from Wyoming. Vol. 24, pp. 19-21.

Verbal, April 2, in reference to extinct mammals from the Tertiary of Wyoming. Vol. 24, p. 37

Verbal, April 9, in reference to fossils from Niobrara river. Vol. 24, p. 39.

Verbal, June 11, in reference to a Mastodon of New Mexico. Vol. 24, p. 142.

Verbal, July 2, on the genus Chisternon and some Cretaceous fishes. Vol. 24, pp. 162-3.

Verbal, July 9, on Artemia salina from Salt Lake, Utah; and on fossil shark-teeth. Vol. 24, pp. 164-5.

Letter dated Fort Bridger, Uinta Co., Wyoming, July 24, 1872, from Dr. Leidy to Mr. G. W Tryon, Jr., in reference to fossil mammals found there. Vol. 24, pp. 167-9.*

Verbal, Sept. 3, in reference to ants observed at Fort Bridger. Vol. 24, p. 218.

Verbal, Sept. 10, about mineral springs in Wyoming and Utah. Vol. 24, pp. 219-20.

Verbal, Oct. 1, in reference to a recently opened corundum mine in Chester Co., Pa. Vol. 24, pp. 238-9.

* Dr. Leidy sent a copy of this letter to The American Jour. of Science and Arts, because in it he referred to Hemisaurus platyurus, Cope.

Verbal, Oct. 15, in reference to Uintatherium and other fossil remains, to chipped stones; a stone implement, and to the action of sand and wind on rocks of Wyoming. Vol. 24, pp. 165-6.

Verbal, Nov. 5, notice of fossils from Wyoming. Vol. 24, pp. 267-8.

Verbal, Dec. 10, notices of fossils from Wyoming. Vol. 24, pp. 277-8.

1873.

Verbal, Jan. 21, notice of fossil vertebrates from Virginia. Vol. 25, p. 15.

Verbal, Feb. 4, notice of remains of fishes in the Bridger Tertiary formation. Vol 25, pp. 97-9.

Verbal, March 18, notice of an extinct hog found in the Pliocene sands of Niobrara river. Vol. 25, p. 207.

Verbal, April 1, notices of bituminous coal from Westmoreland, Pa., of a black rat, and of a specimen of iron ore. Vol. 25, p. 257.

Verbal, April 15, notices of extinct mammals of California. Vol. 25, pp. 259-60.

Verbal, April 22, notice of a fungus parasite on a mouse. Vol. 25, p. 260.

Verbal, Oct. 14, notice of Distoma hepaticum. Vol. 25, p. 364.

Verbal, Dec. 9, notice of Lingula found in the stomach of a fish taken in the Susquehanna river. Vol. 25, p. 415.

Verbal, Dec. 16, notice of fossil elephant teeth. Vol. 25, pp. 416-7.

Verbal, Dec. 23, notice of intercellular circulation in plants, as in Vaucheria. Vol. 25, p. 420.

1874.

Verbal, Jan. 13, notice of Hydra, Vol. 26, p. 10.

Verbal, Feb. 3, notice of Protozoa. Vol. 26, pp. 13-5.

Verbal, Feb. 17, on the mode of growth of Desmids. Vol 26, p. 15.

Verbal, March 24, on Actinophrys. Vol. 26, pp. 23-4.

Verbal, April 21, on the enemies of Difflugia, and on a supposed compound derived from leather. Vol. 26, p. 75.

Verbal, May 12, notice of some new fresh-water Rhizopoda. Vol. 26, pp. 77-9.

Verbal, June 16, observations on some fresh-water and terrestrial Rhizopoda. Vol 26, pp. 88-9.

Verbal, Aug. 25, observations on Pectinatella magnifica; on a parasitic worm which infests the house-fly; and on some fresh-water Infusoria. Vol. 26, pp. 139-40.

Verbal, Sept. 8, notice of a remarkable Amœba; its process or mode of swallowing. Vol. 26, pp. 142-3.

Verbal, Sept. 15, on the motive power of Diatomes. Vol. 26, p. 143.

Verbal, Sept. 22, on sponges. Vol. 26, p. 144.

Verbal, Oct. 6, notice of some Rhizopoda. Vol. 26, pp. 155-7.

Verbal, Oct. 20, notice of Dryocampa. Vol. 26, p. 160.

Verbal, Nov 10, notices of remains of Titanotherium, on supposed spermaries in Amœba, and of Rhizopoda. Vol. 26, pp. 165-8.

Verbal, Dec. 15, notice of some fossils presented. Vol. 26, p. 223.

Verbal, Dec. 22, observations on Rhizopoda. Vol. 26, pp. 225-7.

1875.

Verbal, Jan. 12, report of a fungus in a Flamingo. Vol 27, p. 11.

Verbal, Feb. 2, account of some parasitic worms. Vol. 27, pp. 14-5.

Verbal, Feb 9, notices of some nematoid worms. Vol. 27, pp. 17-8.

Verbal, March 16, observations on marine Rhizopoda. Vol. 27, pp. 73-4.

Verbal, April 6, observations on a coal fossil; on elephant remains; and on Stephanoceros. Vol. 27, pp. 120-2.

Verbal, April 20, observations on a curious Rhizopod; on Psorosperms in a mallard duck; on a mouthless fish; and on Ouramœba. Vol. 27, pp. 124-7.

Verbal, Sept. 7, on Mermis acuminata. Vol. 27, p. 490.

Verbal, Oct. 4, observations on Rhizopods, and on Quercus heterophylla. Vol. 27, pp. 413–5.

1876.

Verbal, Jan. 4, observation on Petalodus. Vol. 28, p. 9.
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Verbal, April 11, remarks on Arcella. Vol. 28, pp. 54–5.
Verbal, May 9, remarks on fossils from the Ashley phosphate beds. Vol. 28, pp. 80–1.
Verbal, June 20, observations on vertebrate fossils from South Carolina. Vol. 28, p. 114.
Verbal, June 27, remarks on the rhizopod genus Nebela. Vol. 28, pp. 115–8.
Verbal, Oct. 10, on the structure of precious opal and on Rhizopods. Vol. 28, pp. 198–9.
Verbal, Dec. 5, remarks on Umbellularia and Hymenium. Vol. 28, pp. 255–6.

1877.

Verbal, Jan. 23, on the present contamination of the drinking water; on Eunotia caniadense, and an instance in which the dome of the human diaphragm was elevated to a level of the anterior extremity of the first rib. Vol. 29, p. 22.
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Verbal, June 12, on parasitic Infusoria. Vol. 29, pp. 259–60.
Verbal, June 19, remarks on seventeen year locust, the Hessian fly and a Chelifer. Vol. 29, pp. 260–1.
Verbal, June 26, account of the birth of a Rhizopod. Vol. 29, pp. 261–5.
Verbal, Sept. 4, remarks on the bedbug and its allies. Vol. 29, p. 284.
Verbal, Oct. 2, account of the Dinamoeba's mode of feeding. Vol. 29, pp. 288–90.
Verbal, Oct. 9, remarks on the discrimination of a Heliozoön in selecting food. Vol. 29, pp. 291–2.
Verbal, Oct. 23, remarks on Rhizopods, and on fossil fishes. Vol. 29, pp. 293–4.
Verbal, Nov. 13, remarks on ants. Vol. 29, p. 314.
Verbal, Nov. 27, remarks on the American species of Difflugia. Vol. 29, p. 306.
Verbal, Dec. 18, notice of Rhizopods in an apple tree. Vol. 29, p. 321.

1878.

Verbal, Feb. 19, remarks on citrine or yellow quartz. Vol. 30, p. 40.
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Verbal, May 14, about parasitic worms of the shad. Vol. 30, p. 171.
Verbal, Aug. 27, that he had found Foraminifera in the sand about Cape May, Atlantic City, etc. Vol. 30, p. 292.
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Verbal, Oct. 8, remarks on Crustaceans of Cape May. Vol. 30, p. 336.
Verbal, Oct. 15, notice of Tetrarhynchus. Vol. 30, p. 342.
Verbal, Nov. 12, on Donax fossor. Vol. 30, p. 383.
Verbal, Nov. 19, notice of the Gordius in the cockroach and leech. Vol. 30, p. 383.
Verbal, Dec. 3, on Taenia mediocanellata. Vol. 30, p. 406.

1879.

Verbal, Jan. 28, on Gordius, and on parasites of the rat. Vol. 31, pp. 10–1.
Verbal, Feb. 4, remarks on fossil remains of a Caribou. Vol. 31, pp. 32–3.
Verbal, Feb. 18, remarks on Bothriocephalus latus. Vol. 31, p. 42.
Verbal, June 17, statement in reference to Rhizopods in Sphagnum. Vol. 31, pp. 162–3.

Verbal, July 8, notice of fossil foot-tracks in the anthracite coal measures. Vol. 31, pp. 154-5.
Verbal, July 22, account of the explosion of a diamond. Vol 31, p. 155.
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1880.

Verbal, Jan. 20, remarks on specimens of Filaria immitis of the dog. Vol. 32, pp. 10-2.
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Verbal, April 13, notices of pond life near Woodbury, N J. Vol 32, pp 156-8.
Rhizopods in the mosses of the summit of Roan mountain, North Carolina. Vol. 32, pp. 333-40.
Verbal, Sept. 27, account of a visit to a bone cave near Stroudsburg, Pa. Vol 32, pp. 346-8.

1881.

Verbal, Jan. 4, notice that Rhizopods are eaten by young fishes. Vol. 33, pp 9-10.

1882.

Verbal, Jan. 3, remarks on some rock specimens. Vol 34, pp. 10-2.
Verbal, Feb. 7, notice of Filaria in black bass. Vol. 34, p. 69.
Verbal, Feb. 28, remarks on his collection of Tourmalines, which he exhibited. Vol 34, pp. 71-4.
Verbal, March 7, notice of Balanoglossus aurantiacus, and of Scolithus Vol. 34, p 98.
Verbal, April 4, remarks on Sagitta. Vol. 34, p. 102.
Verbal, May 2, remarks on some Entozoa found in birds; also on a coprolite and a pebble resembling an Indian hammer. Vol 34, pp 109-10.
Verbal, May 23, remarks on Bacillus anthracis, on Enchytraeus, Distichopus and their parasites. Vol. 34, pp. 145-8
Verbal, May 30, notice of the yellow ant. Vol. 34, p. 148.
Verbal, Sept. 5, remarks on Balanus. Vol. 34, p. 224-5.
Verbal, Sept. 26, remarks on a collection of tobacco worms, which he exhibited. Vol. 34, pp. 257-8.
Verbal, Oct. 17, notice of a new species of Pyxicola. Vol. 34, pp 260-1.
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Verbal, Nov. 7, notice of topaz and blende. Vol. 34, p. 281.
Verbal, Nov 14, on Actinosphaerium, and Tubularia crocea. Vol 34, pp. 281-2.
Verbal, Dec. 12, remarks on fossil remains of horses. Vol. 34, pp. 290-1.
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1883.

Verbal, Feb. 13, remarks on the reproduction of Anodonta fluviatilis and its parasites [Vol. 35], pp. 44-6.
Verbal, April 24, remarks on a social Heliozoan. [Vol 35], pp 93-4.
Manayunkia speciosa. [Vol. 35], pp. 204-12, 24 figures.
Verbal, Dec 11, notice of a fungus infesting flies; and remarks on Manayunkia [Vol. 35], p. 283.

1884.

Verbal, Jan. 1, notice of an ant infested by a fungus; and of Cassiterite from Dakota. [Vol. 36], p. 9.

Verbal, Jan 14, account of the effects of the storm, Jan. 8, on marine animals of the New Jersey coast. [Vol. 36], pp. 12-3.
Verbal, Jan. 29, remarks on a collection of fossil bones from Louisiana, and on Foraminifera in the drift of Minnesota. [Vol. 36], p. 22.
Verbal, Feb. 26, notice of Distoma and Filaria. [Vol. 36], p. 47.
Verbal, March 4, reference to Dictyophora and Apsilus vorax. [Vol. 36], p. 50.
Verbal, March 18, notice of Eumeces chalcides. [Vol. 36], p. 68.
Verbal, April 22, remarks on vertebrate fossils from Florida. Vol. 36, pp. 118-9.
Verbal, May 6, account of a rare human tapeworm. [Vol. 36], p. 137.
Verbal, May 13, description of Pentastomum proboscideum. [Vol. 36], p. 140.
Verbal, Oct. 28, notice of living organisms found in ice. [Vol. 36], p. 260.

1885.

Verbal, Jan 13, notice of parasitic worms found in birds. [Vol. 37], pp. 9-11.
Verbal, March 10, notice of fossil remains of Rhinoceros and Hypotherium from Florida. [Vol. 37], pp. 32-3.
Verbal, March 24, remarks on fossil Mylodon. [Vol. 37], pp. 49-51.
Verbal, May 19, notice of Bothriocephalus in a trout. [Vol. 37], pp. 122-3.
Verbal, Dec 22, notice of living worms in ice, Lumbricus glacialis. [Vol. 37], p. 406.

1886.

Verbal, Jan 19, remarks on fossil bones of Mastodon and Llama from Florida. [Vol. 38], p. 11.
Verbal, Feb. 23, description of an extinct boar from Florida, and notice of caries in the Mastodon. [Vol. 38], pp. 37-8.
Verbal, March 23, notice of Amia and its probable Taenia. [Vol. 38], pp. 62-3.
Verbal, June 1, notice of Toxodon and other remains from Nicaragua. [Vol. 38], pp. 275-7.
Notices of Nematoid worms. [Vol. 38], pp. 308-13.

1887.

Notice of some parasitic worms. [Vol. 39], pp. 20-4.
Verbal, Feb. 1, notice of a parasite of a bat. [Vol. 39], p. 33.
Verbal, May 31, notice of Asplanchna Ebbesbornii. [Vol. 39], p. 157.
Verbal, Oct. 11, remarks on fossil bones from Florida. [Vol. 39], pp. 309-10.
Verbal, Oct 25, remarks on Hydra. Vol. 39, pp. 310-2.
Verbal, Dec 13, remarks on the bot-larva of the terrapin. [Vol 39], pp. 393-4.

1888.

Verbal, Jan. 10, remarks on a fossil of the Puma. [Vol. 40], pp. 9-10.
Verbal, Feb. 14, notice of Chætopterus from Florida. [Vol. 40], p. 73.
Verbal, Feb. 28, notice of Lepas fascicularis, and of a tapeworm in a cucumber. [Vol. 40], pp. 80-1.
Verbal, March 20, notice of the habit of Cirolana concharum, and remarks on parasites of the striped bass. [Vol. 40], pp. 124-5.
Verbal, March, 27, notice of the Trematodes of the muskrat; remarks on Entozoa of the terrapin. [Vol 40], pp. 126-8.
Verbal, April 3, notice of a Crustacean parasite of the red snapper. [Vol. 40], p. 134.
Distinctive characters of Odontaspis littoralis. [Vol. 40], pp. 162-4.
Parasitic Crustacea. Vol. 40, p. 165.
Verbal, May 1, notice of parasites of the Rockfish; and of the louse of the Pelican. [Vol 40], pp. 165-6.
Verbal, May 8, notice of the parasites of the Pickerel. [Vol. 40], p. 169.
Verbal, Oct 2, notice of anomalies of the human skull. [Vol. 40], p. 278.

Verbal, Nov 27, remarks on the fauna of Beach Haven, N. J [Vol. [illegible]], pp. [illegible]
Verbal, Dec. 11, notice of the food of barnacles. [Vol. [illegible]], p. 421.

1889.

Verbal, Jan. 1, remarks, with illustrations, on several gregarines, and a singular mode of conjugation of one of them. [Vol. [illegible]], pp. 9–11.

Verbal, Feb 19, remarks on a fossil remnant of the sabre-tooth tiger from Florida. [Vol. [illegible]], pp [illegible].

Verbal. March 5, notice of Gonyleptes and Solpuga. [Vol. 39], p. 15.

The Boring Sponge, Cliona. [Vol. [illegible]], pp. 70–5.

Verbal, April 16, notice of a parasitic Copepod. [Vol. [illegible]], p. [illegible].

Verbal, April [illegible], remarks on fossil vertebrates from Florida. [Vol. 39], pp. [illegible]–7

1890.

Verbal, March 4, notice of *Hypoderas* in the Little Blue Heron, and of an Ichneumon fly. [Vol 39], p. 60

Verbal, March 25, remarks on fossil vertebrates from Florida. [Vol. [illegible]], p. 61.

Verbal, May [illegible], remarks on Hippotherium and Rhinoceros from Florida. [Vol [illegible]], pp 182–3.

Verbal, May 27, remarks on Mastodon and Capybara of South Carolina. [Vol. 39], pp. 184–5.

Verbal, Sept. [illegible], remarks on Ticks [Vol. [illegible]], pp. 278–80

Verbal, Sept. 30, notice of parasites of Mola rotunda. [Vol. [illegible]], pp. 281–2.

Verbal, Oct. 7, notice of Beroe on the New Jersey coast. [Vol. [illegible]], p 341.

Notices of Entozoa. [Vol 39], pp 410–8.

Verbal, Nov 11, notice of Velella. [Vol [illegible]], p 408.

1891.

Verbal, Feb. 17, notice of the Boring Sponge of the Oyster [Vol [illegible]], p. 122.

Notice of some Entozoa [Vol 40], pp 234–6.

Dr Leidy presided for the last time at the meeting of April 14

Many of the above communications were copied by foreign and domestic periodicals, and many of them he included in elaborate essays on the same subjects

Transactions of the Wagner Free Institute of Science of Philadelphia. (Small Quarto.)

Notice of some fossil human bones. Vol 2, pp. 9–12, 2 plates, Dec , 1889

Description of Mammalian remains from a rock crevice in Florida. Vol 2, pp. 13–7, 2 plates, Dec., 1889.

Description of Vertebrate remains from Peace Creek, Florida. Vol 2, pp 19–31, 2 plates, Dec., 1889.

Notice of some Mammalian remains from the salt mine of Petite Anse, Louisiana. Vol 2, pp. [illegible]–40, 1 plate, Dec., 1889.

On Platygonus, an extinct genus allied to the Peccaries. Vol. 2, pp. 41–50, Dec., 1889.

Remarks on the nature of Organic Species. Vol 2, pp. 51–5.

Miscellaneous.

Notice of the formation of some crystalline bodies in Collodion. Amer. Jour Pharmacy, Vol. 16, pp. 94–6, 1850.

Remarks on some curious Sponges. American Naturalist, Vol. 4, pp. 17–22, 12 figures, 1871.

In Science.

Study of the temporal bone. Illustrated. Vol. 1, Part 1, pp. 380-5; Part 2, pp. 475-7; Part 3, pp. 506-7, 1883.

Crystals in the bark of trees. Illustrated. Vol. 2, pp. 707-8, 1883. Manayunkia is noticed p. 708.

The Journal of Comparative Medicine and Surgery. [Dr. Leidy was one of its collaborators in the department of Comparative Anatomy and Physiology.]

Tapeworm in Birds. Vol. 8, pp. 1-11, 27 figures, Jan., 1887.

Parasites of the Shad and Herring. Vol. 9, pp. 211-5, July, 1888.

Addresses by Dr. Joseph Leidy.

A lecture introductory to the Course of Anatomy, delivered in the University of Pennsylvania, 1853. 8vo, pp. 24.

Valedictory address to the class of medical graduates at the University of Pennsylvania, March 27, 1854. 8vo, pp. 12.

Lecture introductory to the Course of Anatomy in the University of Pennsylvania, for the session 1858-9. 8vo, pp. 24.

Introductory lecture to the Course of Anatomy in the University of Pennsylvania, Oct. 11, 1859. 8vo, pp. 23.

An address on Evolution and the pathological importance of the lower forms of Life, delivered before the graduating class of the Medical Department of the University of Pennsylvania, May 1, 1886. Reprinted from the Therapeutic Gazette for June 15, 1886. 8vo, pp. 21. George S. Davis, Detroit, Mich., 1886.

Biographical Notices.

Biographical Notice of Joseph Leidy, M.D. By Joseph Parrish, M.D. In the New Jersey Medical Reporter and Transactions of the New Jersey Medical Society, Burlington, N. J. Sept. 30, 1853. [Approved by Dr. Leidy.]

Sketch of Joseph Leidy. By Edward J. Nolan. The Popular Science Monthly, Sept., 1880. [Approved by Dr. Leidy.]

Biographical Sketch of Joseph Leidy, M.D. International Clinics, July, 1891.

In Memoriam. Dr. Joseph Leidy. Personal History. Read at the Academy of Natural Sciences, May 12, 1891. By William Hunt, M.D.

Memoir of Joseph Leidy, M.D., LL.D. By Henry C. Chapman, M.D., Professor of the Institutes of Medicine in the Jefferson Medical College. Proc. Acad. Nat. Sci. of Phila. June 30, 1891.

An Address upon Joseph Leidy, M.D., LL.D. His University Career. By William Hunt, M.D. Delivered Nov. 17, 1891, before the alumni and students of the Medical Department of the University of Pennsylvania.

Brief biographical notices of Dr. Leidy may be found in the following works:

A Critical Dictionary of English Literature. By S. Austin Allibone. 1870.

A Supplement to Allibone's Critical Dictionary of English Literature. 1891.

Dictionary of American Biography. By Francis S. Drake. Boston, 1872.

Appleton's American Cyclopædia, or Popular Dictionary. New York, 1873.

Johnson's New Universal Encyclopædia. New York, 1876.

The Physicians and Surgeons of the United States. By William B. Atkinson, 1878. Also in Second Edition, 1880.

A Biographical Dictionary of Contemporary American Physicians and Surgeons. By William B. Atkinson, 1880.

Universal Pronouncing Dictionary of Biography. By Joseph Thomas, M.D., LL.D. Philadelphia, 1886.

Men of the Times. London, 1887.

Appleton's Encyclopædia of American Biography. New York, 1887.

The Osteology of the Lacertilia.

By E. D. Cope.

(*Read before the American Philosophical Society, March 18, 1892.*)

In the following pages is presented a review of the osteology of the Lacertilia with especial reference to the genera represented in the Nearctic fauna. It is based on the skeletons placed at my disposal by the U. S. National Museum, the Academy of Natural Sciences, and those contained in my private collection. It includes also the record of my observations and notes made in the principal European museums twenty-five years ago. The characters discovered by me at that time, which I found to be of the greatest taxonomic importance, I enumerated in a paper which is printed in the Proceedings of the Philadelphia Academy for 1864, p. 224. The use then made of those characters has been generally accepted by subsequent writers.* There are, however, many other characters whose value is of uncertain taxonomic value, which were not then mentioned, and which I now record.

The first description of the osteology of the Lacertilia is that of Cuvier, which is contained in his Ossemens Fossiles; (Vol. x, ed. 1836). This is an excellent one, but the many types discovered since his time render it necessary that a new survey of the subject should be made. In 1856 the Zootomie der Amphibien, by Stannius, appeared. The account of the osteology of lizards given in this work is more complete than that of Cuvier, but it is incomplete in many points, and is not up to the requirements of the present time. The present study is made with especial reference to the necessities of the paleontology of the order, therefore the description of characters is made as specific as possible. The principal novelty will be found in the references to North American Genera, and in the descriptions of the hyoid apparatus. The description of the scapular and pelvic arches in certain genera with the extremities degenerate or wanting, where they have not been previously described, is contained in a separate illustrated paper now in the hands of the editor of the *American Journal of Morphology* for publication.

SKULL.—The premaxillary bone is single except in the Scincidæ, Acontiidæ, and some Geckonidæ (Phyllurus sp.). It is very small in the Iguanid genus Phrynosoma, and in the Agamidæ it is excluded from contact with the vomer by processes of the maxillaries which meet on the middle line. In the Chamæleonidæ the premaxillary is still smaller, the body being narrower than the superior spine, and supporting but one tooth. In the Anguidæ the premaxillary is bounded posteriorly on each side by a foramen which is sometimes large, which is wanting in other families, including the Helodermidæ. In Lepidosternum it is principally on the inferior

* See Boulenger, Ann. Magaz. Nat. History, 1884, p. 117; and Catalogue of Lizards in British Museum, i, 1885; ii, 1885; iii, 1887. This author has added osteological characters of the Eublepharidæ, Uroplatidæ, Pygopodidæ and Dibamidæ.

face of the muzzle. The nasal bones are generally distinct, but in the Varanidæ they are fused into a single narrow median element. In the Chamæleonidæ they do not attain the nasal border, being cut off by the junction of the prefrontal with the premaxillary and maxillary bones. In the genus Feylinia the nasal bones are fused into a broad plate. In Lepidosternum they are completely cut off from the nasal border by the maxillary, which is broadly in contact with the premaxillary spine. In Rhineüra the nasal bone reaches the nares as in Amphisbæna. The frontal bones are separate in the Varanidæ, Helodermidæ, Anguidæ, Scincidæ, Anelytropidæ, Anniellidæ and Amphisbænidæ, and in some Gecconidæ They are coössified in some Gecconidæ; in the Iguanidæ, Agamidæ, Xenosauridæ, Eublepharidæ, Chamæleonidæ and Tiidæ. The parietals are generally fused, the only exception being the Gecconidæ, Uroplatidæ, and Xantusiidæ. Prefontals are always present, and in Anniellidæ, Helodermidæ and Chamæleonidæ they extend posteriorly to the postfrontals, excluding the frontal from the orbital border. Lachrymals are present, but they are fused with the prefrontal in the Scincidæ. The jugal is generally present, even when there is no postorbital arch, as in Gecconidæ, where it is a splint, but in the Amphisbænia, Annielloidea, and in Feylinia, the splint-like element attached to the maxillary extends to the pterygoid posteriorly and the prefrontal anteriorly, and may include the lachrymal. The jugal extends anteriorly as far as the lachrymal except in the Scincidæ. The postfrontal is wanting and in most cases is fused with the postorbital in the Varanidæ and Agamidæ, but in other families it is distinct, with sporadic cases of fusion, as in Cnemidophorus. Superciliary bones are present in Varanus, Phrynosoma and several genera of Agamidæ They belong to the tegumentary system, and articulate, the anterior with the prefrontal, the posterior (absent in Varanus) with the postfrontorbital bone. The supraoccipital is undivided and forms the superior part of the edge of the foramen magnum. Its anterior border is generally loosely articulated with the parietal, joining it by a rudimental or developed median gomphosis with the process supraoccipital. It is generally overhung by the parietal, always so when the parietoquadrate arches are present. It is entirely overroofed by the parietal in the Xantusiidæ, the two elements being connected by a vertical laminiform septum. It is not overhung in the Annielloidea and Amphisbænia, and in these the articulation is a firm complete transverse union. The parietoquadrate arch consists proximally of a process of the parietal, which is directed outwards and posteriorly, which may represent the supramastoid element of the primitive Cotylosauria. Distally this process receives an ascending process of the paroccipital on its inferior aspect, sometimes anteriorly, sometimes posteriorly. This arch is shortened and depressed in the Anelytropidæ and is absent from the Anniellidæ and Amphisbænia. In the Chamæleonidæ it is differently composed, consisting of a superior posterior process of the supratemporal, which rises upwards and reaches the produced apex of the

undivided parietal. The supratemporal is accompanied for a short distance above the quadrate by the ascending process of the paroccipital. The pineal foramen is present in the Chamæleonidæ, Agamidæ, Iguanidæ, Anolidæ, Xenosauridæ, Anguidæ, Lacertidæ, Varanidæ and Scincidæ. It is wanting in the Helodermidæ, Eublepharidæ, Tiidæ, Anniellidæ and in the Amphisbænia. It perforates the parietal bone clear of all sutures in most of the families, but it is near to or on the frontoparietal suture in Iguanidæ and Anolidæ, and is in the frontal in Dipsosaurus and the Chamæleonidæ. The occipital condyle is compound, consisting of portions of the exoccipitals and basioccipital. In many genera these segments become so thoroughly coössified at maturity as to be undistinguishable. In some of the Geckonidæ (as Gecco, Uroplates) the occipital segment is so reduced as to give the appearance of two condyles. In the Amphisbænia the condyle is transverse and concave at the center, leaving the lateral portions prominent.

The postorbital bone when present sends a process posteriorly to the supratemporal, forming the supratemporal arch. In the genera without this arch the postorbital may be wanting, as in Heloderma, or be rudimental as in Anniella. In the genera whose degeneration is advanced, the supratemporal bone is appressed to the parietal, enclosing no *foramen supratemporale*, as in Feylinia. In limbless genera of Anguidæ the supratemporal touches the parietal anterior to the paroccipital, thus reducing the supratemporal foramen. This occurs also in Gerrhonotus, Celestus, Xenosaurus and Xantusiidæ. In Heloderma the supratemporal is a rudiment on the external side of the base of the paroccipital.

The remarkable upward production of the supratemporal in Chamæleon has been mentioned. Here this process takes the place of the parieto-quadrate arch. The exoccipitals are produced laterally, each embracing, with the petrosal in front, the small paroccipital. This sustains the superior extremity of the quadrate. In the snake-like genera, as Feylinia, Anniella and the Amphisbænia, this lateral elongation does not exist. The exoccipital is scale like, and the quadrate is sessile on the side of the skull. The quadrate is generally convex at the upper part of its anterior face, and its external anterior border is produced outwards so as to embrace a longitudinal concavity or conch, with the vertical mass or column of the bone. This column is itself more or less concave, its upper extremity being produced a little backwards. In the Iguanidæ there is another concavity, internal to the column, similar to the external. This is much narrowed in the majority of the families, and in the Varanidæ and Helodermidæ, and in Phrynosoma, Eublepharis, and Celestus it is wanting. In Chamæleon, Anniella and the Amphisbænia there is no external conch, the quadrate being simply a rod; while in Feylinia it is flattened in an anteroposterior plane. The mandibular articulation is more or less bilobate in all except Varanus, where it is plane. In Gecco the bilobation is strongly marked, as in the Permian Theriodonta. The pterygoid bones extend forwards from the quadrates, with which they are

in contact in all forms except Chamæleon, towards the middle line. This portion is generally grooved, but in Xenosaurus it is a slender rod. They are received on the basipterygoid processes of the sphenoid, and then diverge and assume a longitudinal position without meeting on the middle line. They are produced in an angle or process towards the posterior extremity of the maxillary bone, from which they are separated by the ectopterygoid The pterygoids then join the palatines. In a few genera they bear a few small teeth. The palatines are separate from each other and from the maxillaries, but send a process outwards and forwards to the latter. They join in front each its corresponding half of the vomer. The internal nares are situated each between the vomer and the maxillary, and it notches more or less deeply the palatine, which forms its posterior border The vomers are separate in all forms excepting Chamæleon, and they have various forms. In Geconidæ and Anolidæ they are flat and fit closely together, and they have the same character in many Agamidæ and Iguanidæ. In a few members of these families (Uromastix and Sauromalus), they are divided by a groove, which becomes a fissure posteriorly, which is the character in most other lizards. In the Varanidæ each vomer is produced posteriorly on each side this fissure to a greater distance than in other forms The planes of the palate differ much in different families and groups. Thus the vomer is on a much higher plane than the palatines in Chamæleonidæ and Geconidæ, the palatines curving downwards to meet the pterygoids. The latter are generally horizontal, but in Chamæleon they are in a subvertical plane, their free rounded extremities descending and fitting on the inner side of the mandible. They do not quite reach the quadrate In the Agamidæ, Iguanidæ and Geconidæ the internal extremity of the ectopterygoid is directed inferiorly, forming a downwardly directed angle on each side of the palate. In the Amphisbænia the structure of the palate is much more compact than in other lizards The palatines are in contact on the middle line and there is no palatomaxillary foramen That is, the palatine is in close contact with the maxillary, the ectopterygoid being tightly wedged in between them. The pterygoids are in contact throughout their length with the sphenoid, and the proximal and of each is tightly wedged between the latter and the quadrate.

The character of the petrosal must be attended to by any one who desires to understand the relations of the Lacertilia among themselves. In no member of the Lacertilia is the trigeminus foramen closed anteriorly by bony tissue, but it is enclosed by the membrane which forms the anterior wall of the brain case. The petrosal is divided into two parts by the deep notch whose fundus forms the posterior border of this foramen, which may be called the supra- and infraforaminal portions. The infraforaminal portion is divided in most of the families by a longitudinal, keel-like ridge, which forms the superior border of a groove whose inferior wall is formed by the sphenoid This groove is not present in Heloderma and is very shallow in Xenosaurus. It is wanting in the Anniel-

lidæ and Amphisbænia. In the Geccoonidæ it does not exist, nor is the petrosal notched by the foramen, while the anterior border of the petrosal forms a free crest which extends from above downwards and backwards. In the Chamæleonidæ, Agamidæ, Iguanidæ and Anolidæ (families with papillose tongues), the supraforaminal part of the petrosal is short and is bounded by a convex anterior border which marks the position of the anterior semicircular canal In the Nyctisaura, Thecaglossa, Diploglossa, Leptoglossa and Amphisbænia (families with smooth or squamous tongues, except Anniella, Diploglossa and Nyctisaura) the petrosal is produced beyond this curved border below the parietal. In many forms an outline of the semicircular canal, which forms the boundary in the other superfamilies, may be traced, whence I have termed this part of the petrosal posterior to it "the arched body" in my former system of the Lacertilia.* The petrosal is produced furthest beyond this arcade in the snakelike forms of the Anniella and Amphisbænia, reaching almost to the orbit in Lepidosternum. The relation to the parietal differs, the differences resulting from the greater or less reduction of the primitive supratemporal roof and the greater or less entrance of the parietal into the lateral wall of the brain case. In most of the families it is little or not decurved to meet the petrosal, and in the Iguania, where it is decurved, it does not come in contact with the petrosal owing to the shortness of the latter. In certain families where the petrosal is produced beyond the arcade, and the parietal is decurved, the two elements are in contact for a short distance, as in the Varanidæ In the Tiidæ and Scincidæ the contact is mainly effected by a short descending process of the parietal. This process is especially elongate in the Scincidæ The arcade is the anterior border of the petrosal in the Permian Theriodonts, and it marks the position of the anterior semicircular canal. The membranous wall of the brain case, anterior to the petrosal, contains an ossification which is of uncertain homology. It reaches or approaches by its superior extremity the frontal, and might hence be supposed to be the orbitosphenoid, but this homology is vitiated by the fact that its inferior portion passes behind the optic foramen. The latter position is that of the alisphenoid, and so the bone is named by Parker † But there is another element, the epipterygoid, posterior to it and immediately anterior to the petrosal, which has been supposed to be the true alisphenoid. Leaving this question, and adopting for the bone in question the provisional name of postoptic, I remark that is typically triradiate, sending two branches upwards and one downwards. This is its character in Agamidæ, Varanidæ and Tiidæ. The posterior superior branch is much reduced in many Iguanidæ and Lacertidæ and in some Agamidæ (Megalochilus), and it is absolutely wanting in Gerrhosaurus and Chamæleon There is no postoptic in Heloderma. In the Rhynchocephalian genus Sphenodon these two elements coëxist with an orbitosphenoid, lying between the optic and tri-

* Proceeds. Academy Philadelphia, 1864, p. 224.

† Transac. Royal Society, 1879, p. 605, on the "Development of the Skull in Lacertilia"

geminal foramina. The two together may be homologous with the mammalian alisphenoid The epipterygoid is present in all Lacertilia excepting the Chamæleonidæ and Annulati (Amphisbænia) Its superior connections are quite characteristic of the different families. Inferiorly it rests on the pterygoid posterior to its ectopterygoid process, excepting in the Geccouidæ, where its point of attachment is opposite to that process. In the same family it does not reach the parietal, but the superior extremity rests on the apex of the supraforaminal part of the petrosal In the remaining families there are three modes of superior attachment. In most of the Iguania and Acrodonta it reaches the parietal and does not touch the short petrosal. In the other superfamilies it is in contact with the petrosal. In the Varanidæ, Helodermidæ and most Anguidæ it reaches the parietal, which does not meet it with a conspicuous descending process. In Scincidæ and Tiidæ a conspicuous descending process meets it. In a certain number of genera of various families it does not quite reach the parietal. Such are Eublepharidæ, Gerrhosauridæ, Anguis, Lacerta, Phrynosoma (where it rests on the arcade of the petrosal), Iguana, Uromastix, Agama and Gonyocephalus (*subcristatus*) In Lyriocephalus and Phrynocephalus the epipterygoid is very short.

The *semicircular canals* perforate the supraoccipital, the exoccipital and the petrosal The internal is in a subtransverse vertical plane, causing a convexity on the internal side of the supra and exoccipitals, and in some types a visible rib on the superoexternal surface of the same. The external canal is in a horizontal plane and perforates the base of the exoccipitopetrosal suspensorium, causing a horizontal rib on the anterior face of the latter in some forms. The anterior is in a vertical anteroposterior plane, and perforates principally the petrosal, occupying its anterior border, which forms the "arcade" in most of the thick-tongued superorders, but crossing the bone much behind the anterior border in the slender-tongued superorders and the Diploglossa. The *fenestra ovale* is tightly closed by the disk of the stapes, which is continued externally as the rod like columella This rod is slender except in Anniella, where it is remarkably robust. In the other Amphisbænia its tympanic extremity is somewhat thickened. The columella is continued externally into a cartilage which is more or less expanded in the vertico transverse plane, the distal portion always so, forming a vertical lamina in contact with the tympanic membrane. This is the epistapedial cartilage. It is frequently produced upwards beyond its point of attachment into a suprastapedial process. The plate thus formed is almost separate from the proximal axial part of the cartilage in Heloderma.* The axial portion has a descending process, the infrastapedial of Parker, in Lacerta, Heloderma, but not in Eublepharis, Thecadactylus and Phyllodactylus

The rami of the *lower jaw* are united at the symphysis by ligament only. The angle is a prolongation of the articular bone; it is elongate and simple,

* Memoirs U S Natl. Academy Sciences, 1884, Vol. III.

except in Anniella and Chamæleon, where it is absent. The angular bone never reaches the angle, and has an anterior position, being some times fused with the articular. The relations of the segments of the lower jaw are very characteristic in the divisions of the Lacertilia. The splenial bone is wanting in the Chamæleonidæ, and is very small in the Agamidæ. In other families it is well developed. The dentary extends posteriorly on the external face of the ramus, as the splenial diminishes, having the greatest posterior extent in the two families mentioned. The coronoid is differently extended in a similar ratio. Thus it is extended posteriorly on the external side of the ramus, and not anteriorly, in the Chamæleonidæ and Agamidæ, both forwards and backwards in the Geccomidæ, and forwards in the other families. The angular is absent (fused with the articular Boulenger) in the Geccomidæ, Anolidæ, Acontidæ, Anelytropsidæ, Anniellidæ and the Annulata, and is distinct in all other families. The articular and surangular are fused in several genera of Iguanidæ, and there are but three bones in the ramus of Xantusia, q. v. The angular extends well anteriorly on the inferior border of the jaw in this order, but is differently developed on the inner and outer faces. The Chamæleonidæ and Agamidæ again show their similarity in having this element chiefly exposed on the interior side, while in other types the exposure is external. The Meckelian groove is open in the Chamæleonidæ, Agamidæ and Varanidæ, but is roofed over more or less completely in all other families.

The *hyoid system* is not connected with the skull except in Geccomidæ, Eublepharidæ and Lepidophyma, so far as I have examined them. Thus in Thecadactylus, Phyllodactylus and Eublepharis, the ceratohyal is continuous with a cartilage which projects from the paroccipital above the posterior part of the auditory meatus. In Lepidophyma the free epibranchial is attached to the inferior lateral angle of the basioccipital. In forty-two genera of other families enumerated below, this is not the case. In no genus have I discovered any connection with the stapedial cartilages. The hyoid system in lizards consists of a glossohyal which is continuous with a basihyal tract, a hypohyal often continuous with the basihyal tract, a ceratohyal; a first ceratobranchial, and a second ceratobranchial which is always continuous with the basihyal tract. There may be in addition an epibranchial, which belongs to the first ceratobranchial. In some genera, there is a free epibranchial which may be then closely approximated to the ceratohyal (Eumeces, Oligosoma, Gerrhonotus), or to the second ceratobranchial (Lacerta, Xantusia, Lepidophyma). The only constantly ossified element is the first ceratobranchial. The genera and families differ in the presence or absence of the second ceratobranchials and epibranchials, and the proximity or separation of the former. In general the Varanidæ, Anguidæ, Zonuridæ, Gerrhosauridæ, Scincidæ, Lacertidæ and Xantusiidæ have epibranchials, while the thick-tongued and most degraded types are without them. In the Tiidæ the hypobranchials are much produced anteriorly beyond the bases of the ceratohyals, and there are no second ceratobranchials. In Anguidæ the

hypobranchials are also greatly produced forwards, but carry the ceratohyals with them. Ceratobranchials of the second pair are also wanting in Varanidæ, Helodermidæ, Chamæleonidæ, Anguidæ, Anniellidæ and Rhineura; Phyllodactylus, Thecadactylus and Gecko, among Geoconidæ; and Egernia and Gongylus in Scincidæ. Ceratohyals are wanting in Chamæleon, Anguis, Anniella and Annulata generally. In both Agamidæ and Iguanidæ the second ceratobranchials are separated from each other in the depressed genera of terrestrial habits, and in close contact with each other in those of arboreal habits, but they are in close contact in Callisaurus and Crotophytus, both terrestrial genera. In Calotes, Iguana and Anolis they act as the rim on which the gular pouch or fan is stretched. The characters of Lacertilian hyoids may be tabulated as follows. Most of the genera referred to are figured in Plates III to VI.

I. Ceratohyal present	II. Ceratohyal absent
A. A second ceratobranchial.	
a. Free epibranchials present.	
Scincidæ.	
Lacertidæ.	
Xantusiidæ.	
aa. No free epibranchials.	
(Scincidæ) *Mabuia agilis*, *Gongylus ocellatus*.	
Anolidæ.	
Iguanidæ.	
Agamidæ.	
Zonuridæ.	
Eublepharidæ	Chirotidæ
(Geoconidæ) Aristelliger	Amphisbænidæ
AA. No second ceratobranchial.	
a. No free epibranchials.	
Geoconidæ.	Rhineura.
Varanidæ	Chamæleonidæ.
Helodermidæ	
	Anguis.
Tiidæ.	Anniellidæ.
Gerrhosauridæ.	
Anguidæ.	

2. VERTEBRAL COLUMN.—Except in the families of the Geoconidæ and Uroplatidæ, the vertebral centra are procœlous. In the families named, they are amphicœlous. The zygosphen articulation is present in the Tiidæ and the larger Iguanidæ, including a rudiment in Crotaphytus. In smaller Iguanidæ (Sceloporus Phrynosoma) and in Lacertilia generally this kind of articulation is wanting. In a good many families the caudal vertebræ are divided by a transverse fissure or suture in front of the middle, which

often splits the base and sometimes the length of the diapophysis. Such a structure is seen in Iguanidæ (Iguana Sauromalus Sceloporus Dipsosaurus); Anolidæ; Anguidæ (Celestus), Tiidæ (Tupinambis Cnemidophorus); Lacertidæ (Lacerta) and Scincidæ (Gongylus Eumeces) In Dipsosaurus, Anolis and Lacerta, the neural spines of the caudal vertebræ are double, in the other genera named, single In Varanidæ, Helodermidæ, Gerrhonotus, Crotaphytus and Phrynosoma, the caudal centra are undivided, and the neural spines are single. In Ophisaurus the centra are undivided and the neural spines double. The centra are excessively thin in Ophisaurus, so that they break more readily than they disarticulate. There are two sacral vertebræ except in genera with the posterior limbs rudimental or absent. In some of these however, especially the degenerate genera of the Anguidæ, the rudimental ilium is attached to two diapophyses which join each other distally

The first dorsal vertebra is that one which is first connected with the sternum by a hæmapophysis. In genera with a well developed sternum, the number of vertebræ anterior to the first dorsal is eight, except in the *Varanus niloticus* (Cuvier) and *V griseus*, where it is nine In the extinct Dolichosauria of the Cretaceous period, the cervical vertebræ are stated by Owen to number seventeen.

The number of ribs attached to the sternum diminishes with the reduction of the limbs, from the normal number of four on each side to one, and total disconnection A common hæmapophysis or "xiphoid rod," succeeds these on each side, which gives attachment to two separate hæmapophyses for ribs. The common hæmapophysis is a segmentation of the anterior part of the fifth hæmapophysis, and it is not distinct in some genera, as *e. g*, Sauromalus. In Heloderma, the fifth hæmapophysis has no sternal segment or connection, and the sixth is wanting In Varanus the fourth, fifth and sixth are wanting In genera with the two appendicular hæmapophyses, they are closely appressed on the middle line in the majority of the genera, but in genera of depressed form, they are separated often widely. They are separated in *Stenodactylus guttatus*, in Phymaturus, Crotaphytus and Sceloporus. They are more widely separated in Dipsosaurus, and most widely in Sauromalus and Phrynosoma. Cervical ribs are present in varying numbers, and the posterior ones are generally quite elongate. In certain genera and families the ribs posterior to those attached to the sternum have their hæmapophyses fused on the middle line below, thus constituting a series of abdominal ribs. In the Iguanid genus Scartiscus there are two such ribs. In the Anolidæ there are four and five pairs, in the Polychroine Iguanidæ there are seven to ten. In the Chamæleonidæ and Geckonidæ there are several pairs. The ribs of Lepidosternum are remarkable for the presence of a capitular process, which has no distinct capitular articulation.

3. SCAPULAR ARCH.—The clavicle is present in all the families except the Chamæleonidæ, and in certain genera with degenerate fore limbs. In such genera it is the last portion of the scapular arch to remain, and it is

the only element present in Feylinia (Anelytropsidæ) It is always osseous. The form of its proximal extremity varies in the different families. It is simple in the Nyctisaura, Uroplatoidea, Acrodonta, Iguania, Diploglossa and Thecaglossa; and expanded and generally perforate in the other superfamilies where present, except in some degenerate genera where it is simple (see Plate II, Fig 8). In Trachysaurus and Oophias, its proximal end is dilated but not perforate. The scapula varies in form from elongate to short and wide. It presents a proscapular process in many families and genera It is present in Iguania and Nyctisaura; in the last named often decurved and acuminate, and in Lophura, in Acrodonta. It is present among Leptoglossa in Cnemidophorus, and in some Amivæ, while in other Amivæ it is wanting It is wanting generally in Acrodonta, Diploglossa, Thecaglossa and Leptoglossa, but it is present in *Celestus striatus*. It is wanting in Rhiptoglossa. The coracoid is extended anteriorly to the sternum, and it is generally deeply emarginate on its anterior interior border These emarginations are closed by the procoracoid, which extends to the middle line, and is only partially or not at all ossified. There are two coracoid emarginations in most Iguania, exceptions being the terrestrial genera Urocentrum, Sceloporus and Phrynosoma, and the Anolidæ There are also two in Varanidæ and Tiidæ. The Agamidæ generally have but one, but Uromastix is an exception There is but one in Anguidæ and Scincidæ (two in Tiliqua), and none in Helodermidæ and Chamæleonidæ

The interclavicle is a very characteristic element in the Lacertilia. It is wanting in Chamæleonidæ and in some genera with fore limbs rudimental or absent. It is a simple splint in Helodermidæ and some degenerate genera. In other families it has a transverse limb on each side, which may be anterior, producing the "anchor-shaped" form, or median, producing the "cruciform" type It is anchor shaped in Acrodonta, Iguania, and Thecaglossa, and cruciform in Diploglossa and Leptoglossa. In Nyctisaura it is cruciform with the lateral processes wide at the base. The sternum is a broad subrhombic plate which articulates by its anterolateral borders with the procoracoid and coracoid, and by its posterolateral borders with the ribs. In genera with well-developed limbs its principal differences are seen in the nature of its fontanelles when present. In the Agamidæ there are two, and in most Iguanidæ there is one. Exceptions are the genera Polychrus, Sauromalus and Dipsosaurus, where there is no fontanelle. There is none in the Anolidæ. In Tiidæ and Lacertidæ it is present, but in Scincidæ it is mostly absent, exceptions being the North American species of Eumeces. The fontanelle is wanting in Geccoonidæ, Diploglossa, Helodermatoidea, Thecaglossa and Leptoglossa, with the exceptions above noted. The single median fontanelle is frequently concealed by the median limb of the interclavicle. It is nearly divided in some species of Sceloporus.

4. The Pelvic Arch.—It is characteristic of the Lacertilia that the ilium is directed upwards and posteriorly, and that the obturator foramina

are well developed. The latter are only separated from each other by ligament or cartilage, which may sometimes contain some lime salt. It is produced posterior to the ischia in a triangular process, and less frequently into a similar one in front of the pubic symphysis. The pubic foramen is always present. The pectineal process is present except in Geoconidæ, but it is rudimental in some forms, as Phrynosoma. The following table shows the forms of the pubis in twenty-three genera of different families :

I. Pubes uniting at an acute angle.

1. Pectineal process anterior.......... .... *Chamæleon*.
2. Pectineal process median......... .... *Calotes*, *Draco*, *Iguana* *Dipsosaurus* *Anolis*, *Gerrhonotus*, *Tupinambis* *Cnemidophorus*.
3. Pectineal process near acetabulum .... *Scincus*, *Lacerta*, *Eumeces* (rudimental)
4. No pectineal process.... .... *Gonyocephalus*

II. Pubes uniting at an obtuse or very open angle

1. Pectineal process median. ....*Iguana* *Cyclura* *Crotaphytus*, *Histiurus*.
2. Pectineal process near acetabulum ... ... *Agama*, *Phrynosoma* *Sauromalus* *Sceloporus*, *Heloderma*, *Varanus*.
3. Pectineal process none...... . ... *Gecko* (*Phrynosoma*, rudiment)

There is a tuber ischii in all of the genera which have come under my observation except Varanus. In Heloderma and some other forms it is small.

5. THE ANTERIOR LIMB.—The humerus is much alike in all Lacertilia, Chamæleo only presenting peculiarities. The proximal end is expanded nearly in one plane, and the middle portion of the flattened extremity forms the oval head. This is not distinctly isolated, except by the presence of articular surface, from the greater and lesser tuberosities which occupy the angles of the expansion The shaft betrays no twist. The distal end is chiefly occupied by the condyles; but there are epicondyles, of which the internal is the more prominent, except in Chamæleon, where they are wanting. The condyles consist of an external rib and a medio-internal roller, which is generally bounded at the internal extremity by a tuberosity, which is, however, wanting in Chamæleon. The ulna articulates with the median roller, its external edge being beveled by the external rib. The head of the radius articulates with the external rib, having shifted from its primitive position on the inner side. It results from this that in pronation the radius crosses the ulna. There is a short ole-

cranon except in Chamæleon. The ulna and radius have about an equal share in the carpal articulation, sometimes the ulna a little the greater.

The constitution of the carpus is very uniform in Lacertilia with developed anterior limbs, the principal diversity being displayed by the Chamæleonidæ. In all, we have in the proximal row three distinct elements, the radiale, intermedium and ulnare (= pisiforme), the latter mainly external to the ulna and directed posteriorly. Distal to the radiale and intermedium, and between them and the carpalia of the second row, is a single small centrale There are five carpalia, each corresponding to a metacarpal. I have failed to find in any of the genera at my disposal any of the carpalia fused together or wanting. In Chamæleon, on the contrary, Cuvier has shown that there is no ulnare, and that the centrale and carpalia are fused into a single round median piece, to which the metacarpals are articulated. In all the normal Lacertilia the tendons of the flexors of the digits are combined on the palm, and the point of junction is occupied by a large flat sesamoid bone. The number of phalanges is also remarkably uniform. They number in each digit, commencing with the pollex, 2–3–4–5–3. The sole exception in the genera with well developed extremities is Chamæleon, where the numbers are 2–3–4–4–3. This genus differs also from other forms in the shapes of the metacarpals. Normally they are cylindric and subparallel in position and united in a common integument; but in Chamæleon they are flattened, with expanded extremities, and divided into two bundles by a fissure, three within and two without, enabling the three inner digits to oppose the two outer round a branch of a tree. The number of digits in Lacertilia is normally 5–5, but reductions take place presenting variations from 4–5 to 1–1, the posterior limb usually displaying a lesser degree of degeneracy than the anterior, although not always.

6. Posterior Limb.—The femur differs from the humerus in having a distinct head, which is marked off from a trochanter. The former is not hemispherical as in Mammalia, but is somewhat compressed, and is oval in section. The trochanter is on the inferior anterior side of the head, or in the position of the little trochanter of the Mammalian femur. There is no great trochanter, nor third trochanter. The condyles of the femur are not as well defined as in the Mammalia, and the patellar groove is represented by a shallow concavity without lateral ridges. Patella none, with some exceptional rudiments, as in Varanus, *e. g.* In Chamæleo all the prominent features of the femur are toned down; the trochanter being represented by a ridge. The fibula is more slender than the tibia, and is larger distally than proximally, the reverse of what obtains in the tibia. The latter has no crest.

Like the carpus, the tarsus is very uniform in the Lacertilia, the sole important modification being exhibited by the Chamæleonidæ. There are two fused proximal elements, which are probably tibiale-intermedium and fibulare. They are only distinct in Heloderma among North American genera, but a trace of the suture is seen in Varanus. In most Lacertilia

there is then, but one bone of the proximal row, which is flat and wider than long. No centrale, and but two tarsalia, the third and fourth, the latter much the larger. The second metatarsal projects alongside of t. iii, so as to approximate the tibiale; its head is figured by Cuvier as a distinct bone, but he does not describe it as such. In Chamæleon there is a single proximal tarsal element, which is not flattened as in other lizards, and this articulates with a single subglobular tarsale, from which the metatarsals radiate.* The phalanges number, like those of the anterior foot, 2-3-4-5-3, in ordinary Lacertilia, and 2-3-4-4-3 in Chamæleonidæ.

Phyllodactylus Gray

In their osteology the species of this genus conform strictly to the Geoconid type as already described. I have before me the skeleton of *P. tuberculosus*, from which the following description is derived. The premaxillary is single and has a long superior spine, inferiorly it has the posterior border emarginate. Nasals elongate, distinct, emarginate posteriorly for the frontal. Frontal single, rather narrow, completely underarching olfactory lobes. Parietals distinct, wide, without pineal foramen, lying rather closely on supraoccipital, sending backwards the parietoquadrate arch, which encloses a small foramen with the exoccipital. Supraoccipital distinguished from exoccipital by suture. Prefrontal narrow, forming the preorbital border to the middle above; no lachrymal, jugal represented by a splint which extends from the prefrontal to the extremity of the maxillary on the superior surface of the latter. Postfrontal a rather wide V-shaped bone, its longest limb extending posteriorly more than half way to the base of the parietoquadrate arch. No postorbital. Quadrate with a single large, concave, external conch. Paroccipital in the usual position, splint-like.

Vomers in close contact throughout, with a common convex posterior border, an external longitudinal convexity of the inferior surface, and a groove on each side of the median suture, which divides a keel. Palatines short and wide, and with a longer vomerine than maxillary process, and curving downwards below the level of the vomers. Nareal orifices fissure-like except posteriorly and anteriorly, the external border with a dentate process of the maxillary bone directed posteriorly near the middle. Pterygoids much expanded anteriorly, forming with the ectopterygoids and palatines a thin plate, which closes up the palatine foramen, contracting rather rapidly posteriorly to the subcylindric rod-like portion. Epipterygoid extending from the pterygoid at the basipterygoid process, and resting on the apex of the petrosal. Latter produced above

* Cuvier (Ossemens Fossiles, ed. 1836, p. 98) describes a distinct tibiale and fibulare in Chamæleo, and figures them (Plate 245, Fig. 52). These are not represented by Boulenger (Proc. Zoöl. Soc., London, 1891, p. 118). They are in fact not distinct tarsal elements, but are the epiphyses of the tibia and fibula such as exist also in Heloderma and other genera. The tibiale and fibulare are fused into a single element as in other Lacertilia.

anterior to semicircular canal; the anterior border continued into a crest which runs posteriorly above the trigeminal foramen. This terminates at the down looking crest of the subforaminal portion, which bounds externally a wide down-looking groove. Basipterygoid processes long. Sphenoid distinct from basioccipital. Occipital condyle subequally divided into three parts, two prominent exoccipitals and a contracted basioccipital The result is an apparently double condyle.

Mandible with the Meckelian groove closed, and with the splenial small and but little produced beyond the splenial foramen. Coronoid produced a little horizontally at the base. Angular not distinct; surangular and articular distinct. Angle simple, direct, spoon-shaped, with superior concavity. I have observed the following peculiarities in the otic and hyoid regions. There is no infrastapedial cartilage, and the suprastapedial and epistapedial cartilages are continuous. The hyoid system is characterized by the fact that the ceratohyal is attached to the paroccipital, which carries a cartilage on its extremity. There is a short second ceratobranchial, and no free epibranchial.

Vertebræ amphicœlous. Intercentra present throughout the vertebral column, continued into chevrons on the caudal region Cervical ribs widened and truncate at extremities. In the specimen described the diapophyses of the second sacral vertebra are deeply longitudinally grooved on the inferior side so as to be nearly split Diapophyses of anterior caudals elongate. Neural spines distinct but low throughout the column In the scapular arch I note the following peculiarities. There is no proscapula, and the clavicle is much enlarged, and is perforate at the median extremity. The interclavicle is cruciform with the angles filled up so as to have concave borders. It is coössified with the clavicle in *P tuberculatus*, and extends but a little way posteriorly on the sternum. The coracoid has one large foramen. The sternum has no fontanelle. There are four hæmapophyses attached to the sternum on each side, and two to each of the slender closely approximated xiphoid rods. There are several very slender abdominal ribs.

The ilium has no *angulus cristæ*, and the acetabulum is entire The pubes join at a little less than a right angle, and the pectineal processes are short and a little posterior to the middle. Pubes uniting at less than a right angle below, with the tuberosities distal.

The most distinctive feature of the skeleton of this genus is the presence of intercentra throughout the vertebral column, a point in which it resembles the extinct Theromora of the Permian epoch.

EUBLEPHARIS Gray.*

Owing to the isolated position of this genus its osteology is worthy of especial attention. The premaxillary is undivided, and has a long superior spine but no inferior spine. The nasals are distinct. The frontals

* I include in this genus the Coleonyx of Gray, which does not differ generically from the other American species of the family.

are coössified and the interorbital space is very narrow. The parietals are coössified and there is no pineal foramen. The supraoccipital is loosely articulated anteriorly, but is coössified with the exoccipitals. No lachrymal bone; prefrontal large but not reaching far posteriorly over orbit. Postfrontal small, crescentic, no postorbital. No postorbital or supratemporal arches. Parietoquadrate arch depressed, paroccipital lying over the parietal at the inferior extremity. No jugal bone. No orbito sphenoid; the olfactory lobes enclosed below by the frontal bone. Petrosal produced beyond semicircular canal at the superior anterior angle, and without the oblique crest such as is characteristic of the Gecconidæ. A subforaminal projection and groove, the external wall of the groove as prominent downwards as the internal, so that the groove is open inferiorly. Vomers swollen, separated for most of their length by a deep groove. Palatines short and wide, sending a postnareal process to the maxillary. Pterygoids broad and flat in front, narrower posteriorly, with a short ectopterygoid without descending angle, enclosing a maxillopalatine foramen. Basipterygoids elongate. Sphenoid and basioccipital distinct, the latter distinct also from exoccipitals. Occipital condyle convex, without exoccipital portion. Epipterygoid oblique, articulating below posterior to ectopterygoid process of pterygoid and above with petrosal only. Quadrate straight, oblique, with a single conch, which is external to the rod-like axis; condyle emarginate. In the mandible the angular bone is small but distinct, and the coronoid is produced much further anteriorly than posteriorly on the external face of the ramus. The dentary extends to about opposite the middle of the coronoid on the external face of the ramus. The splenial extends posteriorly but not anteriorly. The Meckelian groove closed. In the hyoid apparatus all the elements are present, including a pair of elongate second ceratobranchials. There is a free process of the ceratohyal anterior to its junction with the hypohyal.

The scapular arch is much like that of the Gecconidæ. The clavicle is expanded and perforate proximally. The interclavicle is subcruciform with the limbs connected by laminate expansion. There is a small proscapula which is connected at its apex with the epicoracoid. Coracoid with one large emargination. Sternum without fontanelle, supporting three ribs and a xiphoid rod, which supports but one rib. No abdominal ribs.

Anolis Daudin.

The following osteological description is taken principally from the *A. carolinensis*, but other species which I have examined do not differ from it.

Premaxillary with long superior spine, and no inferior spine, but a notch. Nasals distinct, separated by premaxillary spine. Frontal and parietal bones each undivided, the pineal foramen on the coronal suture. Prefrontal large, not extending over orbit; lachrymal narrow, in contact with jugal. Postfrontal small, distinct; postorbital large. Supratem-

poral slender, forming the greater part of the supratemporal arch, its anterior extremity in contact with the postorbital and postorbital process of jugal bones. Paroccipital small; parietoquadrate arch well developed. Supraoccipital loosely attached, coössified with exoccipital.

The frontal bone is grooved on the median line below. The postoptics are within the epipterygoids, and are curved, enclosing a subcircular space, and have a short external branch The epipterygoid leaves the pterygoid behind the ectopterygoid process, and articulates with the parietal, passing some distance in front of the petrosal The petrosal is very short above; the subforaminal process is distinct, and the inferior groove looks outwards as well as downwards. Quadrate with wide external conch and no internal conch. Stapes not deeply sunk; columella slender. The vomers are flat and elongate, and are not separated by a groove The palatines are broad and flat, and the maxillopalatine foramen is small. The pterygoids are broad and flat in front, and are then abruptly contracted from the outside to a narrow posterior part. This curves outwards from the long basipterygoid processes to the quadrate. The ectopterygoids are short and are deflected at the proximal extremity Presphenoid long and rod-like. Occipital condyle convex, simple, without exoccipital divisions.

The mandible has marked peculiarities. The Meckelian groove is closed, and the splenial bone, if present, is minute. I do not detect it in the *A. carolinensis*. There is a fossa on the inside of the ramus at the base of the coronoid The latter bone is developed much anterior to its apex on the external face, and not posteriorly The dentary is produced far posterior to the coronoid The angular and articular are fused, and the angle is rather short and has an internal angular projection (*Xiphocercus valenciennii*, *Anolis equestris*, *A. marmoratus*, *A. carolinensis*).

The hyoid apparatus has the extreme development seen in all the lizards with a gular compressed pouch or fan That is, the ceratobranchials of the second pair are closely appressed and produced to a great length. First pair of ceratobranchials and ceratohyals simple, the latter attached to the extremities of the moderately developed hypohyals.

The scapular arch conforms to the Iguanid type. There is a procoracoid well above the coracoid, and a single coracoid notch. The sternum has a small median fontanelle which is reached by the long posterior limb of the interclavicle. Two ribs attached to each side of sternum, and three to each of the slender, closely appressed xiphoid rods. There are five pairs of abdominal ribs in *Anolis carolinensis*, and four, five and six in other species.

The vertebræ have no zygosphen nor elongate diapophyses. There are eight cervical vertebræ, of which only the last four have ribs, all of which have simple heads, the last two being elongate and reaching to the plane of the sternum.

The caudal vertebræ have no supplementary dividing suture, and there

is but one neural spine. The chevron bones are attached at the extremity of the centrum.

The pubes unite at an acute angle, and have well-developed pectineal process at the middle of their length. The ischia have a prominent tuber.

The premaxillary and anterior maxillary teeth are simple, the others are tricuspid.

DIPSOSAURUS Hallow.

The osteology of this genus presents a number of interesting peculiarities which constitute difference from Crotaphytus, to which its general appearance suggests affinity

Premaxillary bone with elongate superior spine, and posterior emargination of inferior face. Nasals large, distinct, not shortened in front, since the nostrils open forwards. Frontal narrow, entire, grooved on the middle line below, its posterior region pierced by the pineal foramen which is entirely anterior to the coronal suture (*D dorsalis*) Supraoccipital loosely articulated anteriorly, and not distinct from exoccipitals. Prefrontals large, not extending over orbit; lachrymal smaller, touched by jugal. Postfrontal small, distinct from the large postorbital The latter articulates extensively with both the jugal and supratemporal Paroccipital small. Parietoquadrate arch well elevated. The vomers together as broad as long, not produced posteriorly, with a median fossa Palatine flat, with a short maxillary process; pterygoid flat in front, concave on the inner side behind for contact with the long basipterygoid process Ectopterygoid decurved at its inner extremity. Quadrate with a narrow internal and a wide external conch. Postoptic an open sigmoid, reaching frontal above, with a median expansion with rudiment of posterior limb. Petrosal very short above; subforaminal portion prominent, with a wide inferior groove looking downwards. Epipterygoid leaving pterygoid behind ectopterygoid process, and reaching parietal without contact with petrosal Presphenoid rudimental, sphenoid and basioccipital united, and with prominent lateral edges. Occipital condyle with exoccipital elements feebly distinguished.

In the mandible the Meckelian groove is completely curved. The coronoid has little horizontal extent, and that is principally anteriorly on the external side. The surangular and articular are fused together, and the splenial is small. The dentary extends as far posteriorly as the posterior border of the coronoid. The angle is prominent, flattened so as to be horizontal, and has an internal angle.

The scapula has a large procapula directed upwards, and the coracoid has one emargination, which is large. The sternum has a narrow median fontanelle which is not covered by the interclavicle. There are four pairs of ribs articulated to the sternum, and two continue into the approximated xiphoid rods. The ribs reach the sacrum.

• Vertebræ with a zygosphen articulation. Eight cervical vertebræ, the anterior with a compressed hypapophysis, which soon becomes a keel, which is absent on the eighth cervical and all following vertebræ. Four anterior vertebræ without ribs, seventh and eighth with long ribs. Diapophyses very short, except in the caudal region, where they are present for half its length, increasing in length to the base where they are quite elongate Chevron bones intercentral Neural spines of dorsal region low, of caudal region rather elevated, oblique, and preceded by a compressed vertical prominence or anterior neural spine. The centra are transversely segmented just in front of the diapophysis, except in the anterior part of the series.

The angle of junction of the pubes is nearly right, and the pectineal process is median, short and decurved. The ischia have a long common suture, and are deflected downwards, meeting at less than a right angle Tuber a prominent angle The ilium presents a short subacute angle representing the *crista* There is a deep posterior notch of the acetabulum.

In *Dipsosaurus dorsalis* all the teeth on the maxillary bone are tricuspidate, those on the premaxillary are mostly simple, but one or two external ones show a rudimental lateral cusp.

CROTAPHYTUS Holbrook.

The skeletons of the two most abundant species are before me, viz , the *C. collaris* Holbr and *C wislizenii* B. & G. The following description includes both, and if any differences between the two exist, they are mentioned.

The premaxillary has a long spine above and a concave border behind on the palate, from which projects forwards a pair of juxtaposed processes which together form a button-like process which has an anterior free border The nasals are wide and shortened by the removal of their anterior border on account of the large size and partly vertical direction of the nostrils. Frontal single, narrow ; pineal foramen touching coronal suture, in the frontal bone in *C. collaris*, and in the parietal in *C wislizenii* Prefrontal large, with a prominent preocular boss, not extending posteriorly over the orbit. Lachrymal small in line with and touching the jugal Postfrontal wanting ; its place taken by a process of the frontal Postorbital large, uniting exteriorly with jugal and supratemporal. Parietoquadrate arch elevated, supraoccipital bone loosely articulated, not distinct from exoccipital. Quadrate with rather flat conchs, the external the larger, and with straight external border. Postoptics not reaching frontal, curved, with short posterior branch. Petrosal with prominent subforaminal portion which has an open groove looking downwards. Vomers short and wide, not separated by a groove. Palatines flat, with short maxillary process. Pterygoids rather narrowed by the large palatine foramina, posterior part grooved and receiving basi-

pterygoid processes. Ectopterygoids depressed internally. Epipterygoid originating behind ectopterygoid process, and reaching parietal without contact with petrosal. Presphenoid rudimental, sphenoid and basioccipital confluent. Occipital condyle plain, with exoccipital elements not distinct. The fenestra ovale and foramen of vii nerve sunk in deep fossæ.

In the mandible the terminal part of Meckel's cartilage is exposed. The coronoid has no extension on the external face, and extends a short distance forwards on the inner face. The splenial is rather elongate, and extends anterior to the splenial foramen. The dentary extends to the line of the posterior border of the coronoid above, and of its anterior border below. In old individuals the surangular and articular are fused. The angle is pinched, and sends inwards a horizontal process similar to its posterior process.

In the hyoid apparatus the ceratobranchials of the second pair are closely appressed, thus supporting a median gular angle. The hypohyals are moderately long, and they join by their extremities the ceratohyals, which have no expansions, and are of only moderate length.

The scapula has a well developed proscapula, and there are two deep emarginations of the coracoid. The sternum has a narrow longitudinal median fontanelle in the *C. collaris*, and no fontanelle in *C. wislizenii* (one specimen of each examined). There are four ribs articulating directly with the sternum on each side, and two via each xiphoid rod. The latter are not closely appressed as in some, nor so widely separated as in other Iguanidæ.

Vertebræ without zygosphenal articulation, but the prezygapophyseal faces concave. Cervical vertebræ eight, the anterior five vertebræ with six free intercentra in *C. wislizenii*, and four vertebræ with five intercentra in *C. collaris*, anterior three vertebræ without ribs in both species. The neural spines are very low on the dorsal vertebræ, and are a little more elevated on the caudals. The latter have a projecting keel towards the anterior part in the *C. wislizenii* (wanting in *C. collaris*), which represents the anterior neural spine of *Dipsosaurus dorsalis*. The centra in Crotaphytus are not segmented. Diapophyses are present, but are nowhere long. Short ribs extend to the sacrum.

The teeth are tricuspid, but in the two species examined the lateral cusps are rudimental. Anterolateral and incisor teeth simple, subequal.

The pubes unite at an exceedingly open angle, and the pectineal process is submedian. Tuber ischii prominent; a small angle or crista ilii. Acetabulum entire posteriorly.

The principal characters in which the skeleton of the Crotaphytus differs from Dipsosaurus are the following: Nasal bones shortened in front, no postfrontals; pineal foramen connected with coronal suture; Meckelian canal partly open; two notches of coracoid; xiphoid rods not appressed, no zygosphen; caudal centra not divided; acetabulum not deeply notched.

SAUROMALUS Duméril.

The following description of the osteology of this genus is based on a skeleton of the *S. ater*, belonging to the National Museum.

The premaxillary has a long spine above and a transverse posterior border below with the anteriorly directed button process. The nasals are well developed and distinct in spite of the large size of the nares. Frontal entire, rather narrow, grooved on the middle line below, and including pineal foramen, which touches the coronal suture. Parietals divided perhaps abnormally in specimen. Supraoccipital loosely attached, but fused with exoccipitals. Prefrontals large, not extending over orbits; lachrymals small, in contact with jugal. Postfrontal distinct, small. Apex of postorbital cartilaginous, inferior face in long contact with jugal and supratemporal. Paroccipital not large: parietoquadrate arch well separated from exoccipital. Postoptic not reaching frontal, superior extremity expanded backwards and forwards. Petrosal very short above, prolonged below, inferior groove looking laterally. *Fenestra ovale* and *foramen nervi octavi* sunk in deep fossæ. Vomers entirely separated from maxillaries, not produced, but separated by a groove behind. Palatines with a short maxillary process. Palatine foramen moderate; pterygoids divaricating from each other outwards. Ectopterygoid produced downwards at the posterointernal angle. Pterygoids grooved from basipterygoids backwards on internal side. Quadrate with two conchs, the internal one flat. The epistapedial cartilage is largely ossified.

Presphenoid a slender rod; sphenoid and basioccipital confluent. Occipital condyle with exoccipital elements slightly marked above.

In the mandible Meckel's cartilage is completely enclosed. The splenial is produced but little beyond the splenial foramen. Coronoid extended a little anteriorly at base on external face of ramus, and a little further on the inner side. Dentary extending as far back as coronoid. Articular and surangular distinct.

The premaxillary and anterior maxillary teeth are simple, the other maxillaries have two or three denticles anteriorly and one posteriorly. In the dentary bone the teeth (except in front) have two denticles on each edge.

The hyoid apparatus displays a pair of parallel but separate second ceratobranchials about half as long as the first ceratobranchials. Ceratohyals slightly expanded proximally, articulated at end of moderately long hypohyals.

The vertebræ display a zygosphenal articulation. Five cervicals display free intercentra, and four of them have no ribs. Ribs extending to sacrum. The two sacral centra and diapophyses are distinct, but the second diapophysis has a median longitudinal groove. Caudal centra of the distal half of the tail segmented, and possessed for the middle of the length of double diapophyses, between which the fissure passes. Diapophyses long on basal third of tail. Neural spines low everywhere; on the caudal vertebræ they stand at the posterior end, and send a keel to

the anterior end, where it is elevated into a low anterior spine. Chevron bones intercentral. Four sternal ribs and two from the xiphoid rod.

Scapula very short, with a large superior proscapula. Coracoid with two notches. Sternum wide and emarginate posteriorly, spreading the xiphoid rods far apart. No fontanelle.

Pelvis with the pubis transverse and the pectineal process external. Ischia rather slender, with a short symphysis, and each with a long tuberosity.

This genus is remarkable for the combination of characters it displays. The zygosphenal articulation allies it to Dipsosaurus and the larger Iguanidæ, but the separated ceratobranchials, and the wide sternum are like that of the Phrynosomas, with the exception of the fontanelles. The transverse pubes have a similar significance.

Sceloporus Wiegmann.

As a basis for an examination of the osteology of this genus I have before me two skeletons of the *S. undulatus* and one of the *S. spinosus*, from the National Museum.

The premaxillary bone has a long superior spine, and is truncate on the palatal face, and has the button-like process. The nostrils are partially vertical so that the nasals are a little shortened in front. The latter are rather large and are distinct. The frontal is simple and narrow, and is strongly grooved on the middle line below. The parietal is short and wide, and is perforated by a large pineal foramen which touches the coronal suture. Parietoquadrate arch distinct. Supraoccipital broadly but loosely attached, confluent with exoccipitals. Prefrontals large, not reaching postfrontals above; lachrymal small and joining jugal. Postfrontal a small splint; postorbital large, extensively in contact with jugal and supratemporal. Paroccipital small. Vomers short, divaricate and separated by a deep notch behind. Palatine with the vomerine process longer than the maxillary; palatine foramen large. Palatines and pterygoids well separated from each other on the middle line; ectopterygoid deflected at its internal extremity. Basipterygoids developed. Quadrate with two conchs, the internal the narrower. Presphenoid rudimental; sphenoid and basioccipital codossified, descending lateral processes of the latter strongly developed. The supraforaminal part of the petrosal is very short; the infraforaminal portion is produced beyond it and is nearly horizontal in position. The *foramen nervi octavi* is at the bottom of a fossa. Epipterygoid resting on pterygoid much posterior to ectopterygoid and reaching parietal without touching petrosal. Occipital condyle not subdivided by grooves.

The hyoid system includes a pair of well separated short second ceratobranchials, and rather long and slender first ceratobranchials and ceratohyals, which have no expansions. Hypobranchials moderate, supporting ceratohyals at extremities.

Mandible with Meckel's cartilage exposed at the distal part. Coronoid

not horizontally produced on external face. Articular and surangular united Splenial moderately elongate; dentary extending behind coronoid on external face and deeply notched. Angle short, horizontal, with short internal angle. Five cervicals with intercentra in *S. undulatus* and six in *S. spinosus;* three without ribs in both. Ribs extending to sacrum Sacral centra not coössified. Sacral diapophyses coössified distally; the second with a posterior free angle distally Caudal diapophyses well developed at base of tail From about the eighth caudal the centra are segmented in front of the middle.

Scapula with proscapular process; coracoid with one notch. Sternum with a very large fontanelle. Two ribs join the sternal plate; one comes off the base of the xiphoid rod, and two articulate with the latter, total, five pairs. The ilium has a small *angulus cristæ*, and the acetabulum is not emarginate behind The pubes are nearly transverse, and the pectineal angle is external. The ischia are rather slender, and the tuber is an angle.

The middle and posterior teeth are feebly tridentate, the others are simple.

PHRYNOSOMA Wiegmann.

The following account of the osteology is derived from the skeletons of three species, the *P. douglassii*, *P. cornutum* and *P. coronatum*. The description applies equally to each of these species unless otherwise stated.

The premaxillary has a very short alveolar portion which does not bound the nostrils below (or very little *P coronatum*) It has a superior spine and concave palatal border The nasals are distinct and are excavated in front by the large nareal openings. The frontal is single, is much narrowed in front by the prefrontals, but extends transversely posterior to the orbits, where it sends forwards an acute process in the superciliary angle. The prefrontal is large and extends posteriorly to or beyond the middle of the supraorbital border It sends posteriorly an acute superciliary process, which meets that of the frontal from behind, over the eye in *P cornutum;* does not quite meet it in *P. coronatum*, and fails to meet it by a longer interval in *P. douglassii.* The lachrymal is small and is not reached by the anterior angle of the jugal. The parietal is broad and short, and the pineal foramen pierces it at the coronal suture. Its lateral border is very little decurved to meet the petrosal.

Its strong parietoquadrate arch supports a horn or tuberosity, and in most of the species the middle of the posterior border supports the same. The occipital is broadly articulated with the parietal in *P. douglassii* and *P coronatum;* in the former loosely, in the latter closely In *P. cornutum* it affords a narrow but firm support for the parietal. Paroccipital small, visible from behind The postfrontal is visible as a rudiment in *P. douglassii*, but it is apparently coössified in the two other species. The postorbital is slender, expanding below for union with jugal and supratemporal. The former bears two sharp tuberosities in *P. coronatum*, and the supratemporal two. In *P. cornutum* there is none on the jugal but there

are three on the supratemporal; and in *P. douglassii* the arrangement is similar. Owing to the inferior position of the supratemporal, the quadrate is oblique forwards and downwards. It presents one conch, the external. The vomers are short, and are separated from each other for the posterior half or more of their length by a hiatus, which continues posteriorly of about equal width between the palatine and pterygoid pairs. The latter are short, wide and flat, and the palatine foramen is small; least and oval in *P. coronatum*, small and round in *P. cornutum*; larger and elongate in *P. douglassii*. The ectopterygoid is decurved at its inner extremity The presphenoid is wanting, and the suture between the sphenoid and the basioccipital is persistent. The supraforaminal part of the petrosal is very short, and the infraforaminal part is not much produced, and has a wide inferior groove. The epipterygoid originates behind the ectopterygoid process, and has the peculiarity among Iguanidæ of not reaching the parietal, but of resting on the anterior border of the petrosal. The occipital condyle shows traces of its tripartite composition. The postoptic is curved and simple and does not reach the frontal bone. The latter is grooved on the middle line below

The groove of Meckel's cartilage is open throughout in *P. cornutum* and *P. coronatum* and distally only in *P. douglassii*. The coronoid is not produced horizontally on the external face of the mandible, and the dentary is not produced beyond its posterior border. This element has a reflected inferior border in the *P. cornutum* which is acutely dentate posterior to the middle; characters absent from *P. coronatum* and *P. douglassii*. In *P. douglassii* the surangular is not coössified with the articular, while it is so united in the other two species. The angle is short, and is directed downwards and obliquely inwards.

The basihyal is wide and is ossified, and the second ceratobranchials are very short and widely separated. The hypohyals are short and carry the ceratohyals on their extremities. No expansions of lateral elements.

The vertebræ have no zygosphen articulation, but the prezygapophyseal facet is carried upon the side of the neurapophysis at an angle with the usual position. This furnishes the initial step in the production of a zygosphen. I find five cervical intercentra in *P. cornutum* and *P. coronatum*, and six in *P. douglassii*, exclusive of the intercentrum of the atlas, which has no hypapophysis. Ribs extend to the sacrum, and are attached to very short diapophyses. The two sacral diapophyses are separated by a wide fissure in the *P. coronatum* and *P. douglassii*, but are closely appressed in *P. cornutum*. On one side of the skeleton of *P. douglassii* the last lumbar vertebra carries, abnormally, a third sacral diapophysis which reaches the ilium. Proximal part of caudal vertebræ with long diapophyses. Caudal centra not segmented. Chevron bones intercentral, not uniting distally. Neural spines everywhere very low, those of the caudal vertebræ single.

The suprascapula is exceptionally elongate, and the scapula is of moderate length and has a prescapular process. The coracoid has one emar-

gination. The interclavicle is remarkable for the shortness of its posterior limb, which is shorter than the transverse limb in *P. cornutum* and *P. douglassii*, and equal to it in *P. coronatum*. The sternum has a very large fontanelle which approaches the posterior border. In *P. coronatum* and *P. douglassii* three ribs articulate with the sternum, but in *P. cornutum* two only in my skeleton. The xiphoid rods are widely separated, and carry but one rib.

The ilium has a short *angulus cristæ*, and the acetabulum is entire. The pubis and ischium are slender and transverse in position, and approach nearly at their symphyses, which are connected by a short, narrow cartilage. The pectineal process is obsolete, while the tuber ischii is a prominent angle.

Two peculiarities especially distinguish this genus among Iguanidæ: first, the connection of the epipterygoid with the petrosal; and, second, the absence of symphysis of the chevron bones. The characters of the sternum are an extreme of what is seen in Sceloporus.

Gerrhonotus Wiegm.

A skeleton of the *G. multicarinatus* from the U. S. National Museum, furnishes the material for an osteology of this genus.

The premaxillary has a well-developed spine and a truncate palatal border. Its alveolar border is short, and it forms but a small part of the inferior nareal border. Nasal bones not short in front, rather narrowed by the maxillary and prefrontals on each side. Frontal narrow, single, partly enclosing olfactory lobes of the brain below, but the incurved lateral walls not touching. Parietal with small pineal foramen far behind coronal suture. Supraoccipital loosely articulated, and separated by suture from exoccipitals. Prefrontal not tuberiferous, produced posterior to middle of supraorbital border. Postfrontal crescentic equally united with frontal and parietal. Postorbital splint shaped, with very slight contact with the jugal, and long contact with the supratemporal. Jugal slender, reaching anteriorly the small lachrymal. Paroccipital narrowly exposed posteriorly, well produced upwards on the distinct parieto-quadrate arch. Quadrate with one deeply excavated conch, which is external. Vomers in close apposition in front, separated by a fissure posteriorly, the anterior portion excavated medially. Palatines descending from the plane of the vomers, the vomerine and maxillary processes about equal, main plate rather narrow. Palatine foramen large. Pterygoid contracting gradually into posterior slender portion; basipterygoid well developed. Presphenoid wanting. Sphenoid and basioccipital separated by suture, descending tuberosities of the latter strong, compressed. Epipterygoid originating below opposite basipterygoid; above resting on anterior process of petrosal, and touching parietal just behind an obtuse descending angle of the decurved border of the same. Subforaminal portion of petrosal shorter than supraforaminal portion, an-

closing a very narrow down-looking groove. Basioccipital and exoccipitals coössified; condyle small, simple.

Meckel's canal closed except distally, where it is open on the *under side* of the ramus. Coronoid developed anteriorly on external face of ramus, the dentary not reaching behind its anterior border. Splenial elongate, partly external, angular mostly external; surangular confluent with articular. Angle horizontal incurved with rounded border and concave superior surface.

Hyoid apparatus displays no second and rather short first ceratobranchials. Hypohyal rather long, the ceratohyal extending a little beyond its extremity, and widened at the posterior third. A free epibranchial which has a bifurcate anterior extremity at that of the ceratohyal, and extends posteriorly but little behind the ceratobranchial.

Five cervical intercentra, and two cervicals besides atlas without ribs. The odontoid is coössified with the axis. Ribs extend to sacrum. Sacral diapophyses distinct from each other. Dorsal vertebræ without zygosphen, prezygapophyseal facets not continued on neural arch. Caudal diapophyses present; centra of middle region segmented through them, chevron bones intercentral. Neural spines low, higher on caudal region.

Suprascapula much larger than scapula; no proscapula. One large coracoid notch. Sternum without fontanelle, with three ribs and two attached to xiphoid rod.

Ilium without prominent *angulus cristæ;* acetabulum entire, pubes uniting at an acute angle; pectineal angle medium. Ischia with prominent tuber.

CNEMIDOPHORUS Wiegmann

For characters of the skeleton I have three individuals of the *C. tessellatus* from my own, and one of the *C. sexlineatus* from the National collection. The alveolar portion of the premaxillary is prominent, and is marked off from that of the maxillary bone by a shallow emargination on each side. The superior spine is long, and the palatal border is deeply emarginate to receive the narrow anterior production of the vomers. The nasals are distinct and rather elongate, although encroached on in front by the enlarged nostrils. The frontal is single and is rather narrow. The parietal is without pineal foramen in the adult. The parietoquadrate arch is well elevated, and is braced below by the small paroccipital. The supraoccipital is in close contact with the parietal by its middle portion, and it is distinct from the exoccipital by suture. The prefrontal does not extend above the orbit; the lachrymal is smaller, but rather large, and forms a suture with the jugal. The postfrontal is wanting, being fused with the postorbital. The latter is produced downwards and has a longer suture with the supratemporal than with the narrow jugal. The quadrate has an external conch only. The vomers are elongate and are in contact throughout, but each is swollen on the middle line so that they are divided by a

groove along their common suture. The narsal fissure is long and narrow, and is contracted anteriorly, and then enlarged foramen like at the anterior extremity. The vomerine branch of the palatines is longer than the maxillary branch; the pterygoid branch is not very wide, and the palatine foramen is of moderate size. The ectopterygoid is rather wide and has an anterior suture with the palatine bone as well as with the maxillary, it is deflected posteriorly. Pterygoid moderately expanded anteriorly and contracting gradually, the posterior portion but slightly grooved, and attached to the basipterygoid process by its entire width, and not by the groove only. Presphenoid rudimental, sphenoid distinguished from basioccipital by suture, the latter with descending compressed lateral processes. Petrosal with a short presemicircular process, and a long subforaminal process; the latter presenting an open groove downwards. Inferior face of frontal grooved; postoptic not reaching frontal, triradiate, the two superior limbs shorter than the inferior. Epipterygoid arising opposite ectopterygoid and in contact with a descending lateral process of the parietal and not touching petrosal.

The hyoid apparatus is distinguished, like that of other Tiidæ, by the great prolongation of the hypohyals anterior to the point of attachment of the ceratohyals No second ceratobranchials or free epibranchials

In the mandible the Meckelian groove is closed except at the distal portion The coronoid is produced far anteriorly and not at all posteriorly on the external face, and the dentary does not extend much beyond the tooth line. Surangular distinct; angle horizontal, expanded, and forming an angle inwards. A distinct masseteric fossa, bounded below by the angular Splenial elongate, extending far anterior to the splenial foramen

Teeth with the crowns moderately compressed and unequally bicuspid; those of premaxillary and adjacent part of maxillary bone and corresponding part of mandible, simple

Dorsal vertebræ with zygosphen In both *C. tessellatus* and *C sexlineatus* there are five cervical intercentra besides that of the atlas, and the first rib is on the third or fourth vertebra. Two sacral diapophyses, both robust. Neural spines distinct, moderate, highest in the caudal series; ribs extending to sacrum. Diapophyses very short except in caudal region, where they extend for a considerable part of the length, originating posterior to the middle of the centrum. On the distal part of the caudal series there is an additional short spine-like diapophysis in front of the normal one, and the centrum is segmented between the two. The segmentation disappears anteriorly with the disappearance of this prediapophysis. Chevrons intercentral

The suprascapula is of moderate dimensions and extends to the summit of the neural spine Scapula elongate, and with a large procoracoid. Coracoid with two deep notches Interclavicle with a very long median limb, which is wide at the base and which covers an elongate oval median fontanelle. Three sternal ribs, and two attached to the xiphoid rod.

Ilium with a prominent *angulus cristæ*. Acetabulum entire; pubis di-

rected anteriorly at an acute angle, with median pectineal angle. Ischia directed vertically downwards, with *angulus tuberosus*, and pre- and post-ischiadic acuminate cartilages.

It is remarkable that in the large species of the allied genus Tupinambis the procoracoid process is wanting.

XANTUSIIDÆ.

In addition to the characters which I have previously given, Mr. Boulenger states (*Catal. Brit. Mus.*) that the sternum is without fontanelle. I find the hyoid apparatus has characters somewhat similar to those of the Lacertidæ. The ceratohyals and second ceratobranchials are both present and there is a well-developed free epibranchial. Its proximal end overlaps the distal end of the second ceratobranchial. It passes round the extremity of the first ceratobranchial and extends forwards. In Lepidophyma it has the peculiarity, which I have not seen in any other lizard, of being inserted on the lateral process of the basioccipital. In *Xantusia riversiana* (Plate vi, Fig. 41) it terminates before reaching this point. In Lepidophyma it displays a concave expansion as it passes the extremity of the first ceratobranchial, in which lies the helicoid cartilaginous extremity of the latter. In neither genus are the hypohyals prolonged with the ceratohyals, as in Anguidæ, nor beyond them as in the Tiidæ.

The stapedial disk in Lepidophyma is not sunk in a canal as in the Iguanidæ and some other Lacertilia. The columella is slender, and terminates in the interstapedial cartilage. This supports an oblique cartilaginous rod, one end of which (suprastapedial) is attached to the osseous wall above, and the other longer one (epistapedial) is in contact by a flat surface of its extremity with the membranum tympani (Plate v, Fig. 26).

The remarkable characters of the skull in Xantusia are described under the head of that genus. Bocourt (*Mission Sci. du Mexique*, Pl. xxg, Fig. 2), represents a probably similar structure in Lepidophyma.

XANTUSIA Baird.

My knowledge of the osteology of this genus is derived from the *X. riversiana*, specimens of which I owe to my friend, Dr. J. J. Rivers, of Oakland, Cal.

The *os premaxillare* has an elongate spine above and a nearly transverse posterior border below. Nasals well developed, distinct. Frontal single, grooved below. Parietal single, without pineal foramen, produced posteriorly so as to overhang the occipital bone and foramen magnum; being connected with the former by a median keel which it sends downwards. The supraoccipital is subhorizontal and is not articulated in the usual way with the parietal, having only the median contact above mentioned. It is coössified with the exoccipitals. The prefrontal is small and is not produced far over the orbit. Lachrymal absent. Jugal with the super-

posterior limb expanded. Postfrontal and postorbital fused into a triangular bone which bounds the parietal externally, thus, with the supratemporal, roofing over the temporal fossa. Supratemporal in contact throughout with the parietal except where separated by the narrow splint of a paroccipital. Quadrate with one, a large external conch. Vomers closely juxtaposed throughout, coössified anteriorly, the median portion of the two elements with an excavation. Nareal orifices nearly closed except posteriorly, where the vomerine process of the palatine overarches them. The latter are in contact in front but soon spread apart. Maxillary processes rather shorter than vomerine, depressed below them. Pterygoids narrow throughout, not wider than palatines, their posterior part with a groove which looks upwards and inwards. Basipterygoids overlapping their entire internal face. Ectopterygoids wide, reducing the palatine foramen to a mere slit; with a considerable contact with the palatine, and a recurved portion in contact with the extremity of the maxillary; the internal extremity depressed. No presphenoid, sphenoid separated by suture from basioccipital, whose lateral processes are compressed and decurved. The postoptic bone seems to be wanting. The petrosal is well produced beyond the semicircular canal, and is equally produced below the trigeminal foramen, where it joins a backwards directed process of the basipterygoid. The groove below it is well defined and looks downwards. The epipterygoid rises at the basipterygoid and rests on the anterior border of the petrosal and the posterior border of the well-marked descending process of the parietal. Fenestra ovale not sunk in the fundus of a fossa.

The mandible is remarkable in having but three bones. The articular, angular and surangular are coössified, and the splenial and dentary The coronoid has little horizontal production on the outside of the ramus, and the angle of the dentary extends considerably posterior to it. The Meckelian groove is entirely closed.

The hyoid apparatus is described under the head of the genus Xantusia.

There is no zygosphen. There are six cervical intercentra besides that of the atlas. The cervical ribs commence on the fourth vertebra. Four of these ribs are of peculiar form, being expanded and truncate at the extremity so as to be somewhat fan shaped. Neural spines rather low on the cervical and caudal regions, and lower on the dorsal vertebræ. Caudal vertebræ segmented towards the anterior part, the fissure passing through the middle of the diapophyses. Neural spine single, oblique, posterior; chevron bones normal.

Suprascapula short and wide; scapula without proscapula. Coracoid with one notch; sternum without fontanelle. Interclavicle with moderate posterior limb. Sternal ribs three; xiphoid rods not juxtaposed, supporting two ribs. No abdominal ribs.

Pubes meeting at about a right angle; pectineal angles near the middle, decurved. Pubis with tuber anterior. Ilium without angulus cristæ; acetabulum entire.

The teeth have compressed tridentate crowns, those of the premaxillary bone are not conic, but have also compressed crowns, where traces of denticles are sometimes apparent.

The remarkable features in the osteology of this genus are (1) the peculiar relations between the parietal and supraoccipital bones, which resemble the structure seen in a sea-turtle, (3) the wide ectopterygoid, (4) the absence of lachrymal, (4) the presence of only three mandibular elements. The affinities are a mixture of those of the Lacertidæ and Scincidæ; the large postfrontal bones; the descending processes of the parietals, and the form of the pubes, resembling the corresponding parts in the latter family. The expanded cervical ribs resemble those of the Geccoaid genus Phyllodactylus. The relations of the parietal and occipital bones are quite different from those found in the Lacertidæ and Anguidæ (Gerrhonotus, Celestus, Ophisaurus), where the temporal fossæ are also roofed over. In these forms the contact is normal, *i. e.*, by the elevated median portion of the anterior border of the occipital.

Eumeces Wiegmann.

For the determination of the skeletal characters of this genus I have skeletons of the *E. obsoletus* and *E. fasciatus*, from the National collection.

The premaxillary is split as in other Scincidæ, and the halves are in the closest contact. The common spine is rather elongate, while the palatal suture is simply emarginate. The nasals are not shortened, and are distinct. The frontal is double, and is simply grooved on the middle line below. The parietal is single, and is pierced by the pineal foramen at about its middle. The parietoquadrate arch is well elevated. The supraoccipital is loosely articulated, presenting a truncate median process towards, but not to, a median notch of the parietal. Exoccipital distinct by suture. Prefrontal rather large, not sending posteriorly a superciliary process, and not produced far above the orbit. Lachrymal small; not, or very little visible on external facial surface, and reached by a long internal process of the jugal. External surface of jugal separated widely from prefrontal, its postorbital portion much longer, slender, and rising to meet the postfrontal. The latter is large and unequally V-shaped, the posterior limb broad and covering the temporal fossa between the parietal and supratemporal bones, with more or less of a fissure next the parietal posteriorly. Postfrontal a splint separating the jugal and supratemporal from the postfrontal. Supratemporal well produced anteriorly, and in contact with the parietoquadrate arch for the posterior two-thirds the length of the latter. Quadrate with one, a deep external conch. The vomers are elongate, and also expanded laterally, passing above the prominent palatine laminæ of the maxillary bones. They are in close apposition on the median line, but are so swollen longitudinally as to leave a groove at the common suture. The longitudinal ribs terminate in a pair of appressed hooks which look downwards and backwards at the posterior extremities of the bones. The vomerine branch of the palatine

is not quite as long as the maxillary branch, and is on a superior plane, being in close contact with its mate on the middle line, and forming with the maxillary plate a half tube opening inwards. Pterygoids not very wide, gradually narrowing to the posterior rod which is openly grooved on the inner side. The basipterygoid processes overlap the entire width of the internal face. Ectopterygoid reaching maxillary and jugal, but not palatine, little deflected posteriorly. Presphenoid not ossified; sphenoid distinguished from basioccipital by suture. Latter with subconic descending lateral processes, which enclose a deep fossa on the external side. Postoptic small, simple, crescentic. Petrosal extended well in advance of semicircular canal above; subforaminal portion still more produced bounding a down looking open groove. Parietal sending downwards a rather elongate process in front of petrosal. Epipterygoid originating opposite basipterygoid below, and resting above on the descending process of the parietal and the anterior margin of the petrosal. Occipital condyle tripartite.

Meckel's cartilage exposed from the anteriorly placed splenial foramen. Coronoid a little produced anteriorly on external face of ramus, not at all posteriorly. Surangular and articular distinct; angle flat, rounded, not produced or angular inwards. Dentary produced as far posteriorly as coronoid; splenial rather elongate (forming the inferior border of Meckel's groove in *E. obsoletus*)

In the hyoid system, *E. fasciatus* presents a short second ceratobranchial. The first ceratobranchial has a cartilaginous terminal segment, as has also the ceratohyal. The latter is of moderate length, is without expansions, and is articulated with the extremity of the rather short hypobranchial. There is a large free epibranchial, which commences near the free extremity of the second ceratobranchial, and curving backwards, outwards and then forwards, terminates nearly opposite the middle of the ceratohyal.

The cervical intercentra in the *E. obsoletus* number four, and those of the *E. fasciatus* three, posterior to that of the atlas. There is no zygosphen. The caudal diapophyses are well developed at the base of the series, and are split lengthwise at the middle and distal part of the series by the segmentation of the vertebræ. Neural spine single at posterior extremity of neural arch.

The suprascapula is expanded anteroposteriorly, and the scapula is rather elongate. The latter has no procoracoid, while the coronoid has one emargination. The sternum has a small fontanelle posteriorly placed. There are three costal articulations and a xiphoid rod with two ribs. The latter is in close apposition to its mate, and is expanded outwards at the junction of the first hæmapophysis.

The ilium has no *angulus cristæ*, and the acetabulum is entire. The pubes converge at a subacute angle, and the small pectineal process is nearer the proximal extremity, and is turned downwards. The ischia are subtransverse, and present a wide emargination posteriorly, since the *processus tuberosus* is near the acetabulum.

Besides the family characters, this genus is well distinguished among American lizards by the divided frontal; the overroofing the temporal fossæ by the postfrontal and supratemporal; the descending process of the parietal; forms of the xiphoid rods, and forms of the pelvic bones.

Anniella Gray.

My observations on this genus are based on specimens from San Diego, Cal., presented to me by my friend, James S. Lippincott.

The premaxillary has an elongate spine, and the palatal suture presents backwards two concavities separated by a median projection. The nasals are distinct and rather short and wide. The frontals are distinct and rather wide. The parietal is very large everyway, is single, and has no pineal foramen. The supraoccipital forms a close suture with it, sending forwards a median process for internal gomphosis, and an angle on each side of it. It is coössified with the exoccipital, and is expanded to accommodate the large circle of the superior semicircular canal. The facial plate of the maxillary is large. The prefrontal is above the eye, and is cut off from the postfrontal by an entrant angle only. The lachrymal is small, and is below and separated from the prefrontal. No jugal. Postfrontal crescentic, bounded by both frontal and parietal. Postorbital a caducous scale lying in contact with the posterior limb of the postfrontal. Petrosal with its superior border in close contact with the decurved lateral borders of the parietal, as in a snake. The latter do not, however, descend to the presphenoid, but leave a wide fissure below it which deeply notches the anterior border of the petrosal. Supraforaminal part of petrosal produced to an acute angle, terminating at the parietal border much in advance of the anterior semicircular canal. Body of petrosal *perforated by a large foramen* just in front of the superior part of the quadrate. No parietoquadrate arch, but a posteroexternal angle of the parietal extending near to the proximal extremity of the quadrate. No distinct supratemporal or paroccipital. Stapes with large disk and short stout columella, with thickened tympanic extremity. Vomers continuous anteriorly, slightly divergent posteriorly; excavated by a deep groove posteriorly, which terminates in a fossa medially. The external borders of the posterior apices are turned outwards so as to enclose partially the posterior nares below. The palatines are short, the groove separating the maxillary from the vomerine processes extending to the suture with the pterygoid, so that the maxillary process only appears as the inferior face of the bone. Pterygoids elongated anteriorly, reaching to beyond the middle of the palatine foramen. They extend directly back to the quadrates, being well separated on the middle line, and abruptly notched on the inner side to receive the short angular basipterygoids. They are separated from the sphenoid by a fissure, and are grooved on the inner side posterior to the basipterygoid. Ectopterygoids present, rather slender, enclosing rather large palatine

foramina. No epipterygoid. Nareal fissure overhung by the free edge of the maxillary and palatine bones. Sphenoid and basioccipital and exoccipital coössified. Occipital condyle convex and perfectly simple.

The mandible has an open Meckelian groove, and the surangular and articular bones are coössified, while the angular and splenial bones are distinct. The latter extends well anteriorly. The coronoid extends a little forwards on the exterior face of the ramus, and in both directions on the inner face.

The hyoid apparatus is the most simple among lizards. It consists of a continuous cartilaginous glossobasihyal rod, which is bifurcated posteriorly; and a simple osseous first branchihyal, attached to each of the branches. Other elements wanting.

Ten cervical vertebræ with compressed inferior processes of the centra or hypapophyses. They are coössified with the centra, and are not intercentral in position, hence it is not evident that they are intercentra. No zygosphen. In the *Anniella pulchra* there are seventy three rib bearing vertebræ, and two cervicals without ribs. The sacral and proximal caudal vertebræ have diapophyses, those of the former little different from those of the latter. The fifth vertebra with a diapophysis supports a pair of parallel plates coössified with its inferior face like the chevron or double hypapophysis of a snake. In the succeeding vertebræ similar plates form the basis of a chevron, whose symphysis is turned rather abruptly posteriorly. The position of these chevrons is central and not intercentral. Caudal vertebræ not segmented.

Scapular elements and fore limb wanting. Pelvic arch represented by a pair of slender simple bones which lie near the extremities of the last ribs, one on each side of the vent. They are slightly curved, and are well separated in front. They are very similar to the bones which occupy the same position in the Amphisbænidæ, and are probably the iliopectineal bones of Fürbringer. Teeth simple, acutely conic.

The affinities of the Anniellidæ, as indicated by the above description, are interesting. When I first, in 1864,* pointed out the cranial peculiarities of the genus Anniella, I created for it a distinct family, which I associated with the Acontiidæ and Anelytropsidæ. Subsequently, in 1887,† I proposed for it a still more independent position, making it the type of a special superfamily, which I called the Annulati; a course which had been already adopted by Gill a short time previously,‡ who proposed for it the superfamily of the Annielloidea. The further knowledge of its structure above recorded brings out more clearly its true position. This is, I think, in the Annulati or Amphisbænia. The characters which indicate this reference are: (1) The continuity of the parietal with the petrosal and supraoccipital elements. (2) The absence of epipterygoid. (3) The absence of ceratohyal elements. (4) The hypapophyses of the

* Proceedings Academy Philada., 1864, p. [illegible].

† Bullet. U. S. Nat'l Museum No. [illegible], p. [illegible], 1887.

‡ Smithsonian Report, [illegible], The Progress of Zoölogy for [illegible], p. [illegible].

cervical vertebræ which are continuous with the centra. (5) The partially open chevron bones, which are also continuous with the centra. (6) The sublongitudinal iliopectineal bone and absence of other pelvic elements.

There is agreement in various subordinate features, as the single premaxillary, double frontal, and single parietal; and the absence of supratemporal bone; also the fusion of the surangular and articular bones. There are some differences to be noted. Thus, in some of the Amphisbænia at least, there is apparently an orbitosphenoid bone, which is wanting in Anniella. The pterygoid is more closely adherent to the basis cranii in the Amphisbænia, and there is no palatine foramen, which is present in Anniella. The splenial is of full size in Anniella and the Meckelian groove is open. In the Amphisbænia the groove is closed and the splenial is much reduced.

The presence of scales, the papillose tongue and the distinct tegumentary eye fissure, with the characters above cited, define the Anniellidæ as a very distinct family of the Amphisbænia.

Rhineura Cope.

A specimen of the *R. floridana* Baird from Volusia, Fla., furnishes the characters of the skeleton.

The alveolar border of the premaxillary is very short, and supports only one, a median tooth. The spine is divided into two portions, that below the projecting angle of the muzzle and that above it. The former is contracted a little by a process of the maxillary which enters from the alveolar portion, separating it from the nostril, which is inferior in position. It then expands a little, to form on the upper side of the muzzle a terminal expansion twice as wide as long. The nasals are distinct, and extend to the border of the muzzle, overroofing the nostrils. Frontals wide, distinct, deeply emarginate posteriorly for the parietal. Prefrontal rather large, triangular, sending its apex posteriorly over the orbit and reaching the parietal. Its free border and a narrow band of the parietal form a *crista temporalis*, which do not unite on the middle line into a *crista sagittalis*. Parietal single, without pineal foramen, continuous laterally with the petrosal and alisphenoid, and posteriorly with the supraoccipital, from which it receives on the middle line a gomphosis. Supraoccipital bounding foramen magnum, of which it forms a rather narrow border. A small triangular bone at the extremity of the maxillary may be a jugal or a lachrymal. The alisphenoid and petrosal form the inferior part of the side walls of the brain case, and are separated from the pterygoids and presphenoid below them by a narrow fissure which is widest below the petrosal. The latter sends an angle upwards and backwards between the parietal and exoccipital. The exoccipital sends a prolongation (paroccipital?) downwards and forwards, which gives articulation to the quadrate, bounding the fenestra ovale above. The latter is large and is closed by the large disk of the stapes. The quadrate has no posterior

proximal process, and is oblique proximally, but is more nearly vertical distally. In its posterior angle rests the club-shaped head of the robust *columella auris*.

The vomer presents as its anterior extremity a process which separates a transverse process from each maxillary, and enters a notch in the posterior border of the premaxillary. The vomers are plane in front but become convex and separated by a fissure posteriorly, ending each in an acuminate apex lying on the presphenoid. The palatine is narrow and lies along the inner side of the ectopterygoid, consisting chiefly of its maxillary process; it is doubtful whether it possesses a vomerine process. Posteriorly it lies scale-like on the pterygoid, reaching nearly to the line of the quadrate (Pl. 1, Fig. 5, B pl.). The nareal fissure is nearly closed anteriorly, except a foramen like portion at the anterior extremity. The presphenoid, sphenoid and basioccipital are coössified. To these the pterygoid is closely appressed by the one side, while on the outer side the latter carries the narrow splint-like ectopterygoid as far as the maxillary. No palatine foramen. Occipital condyle simple, transverse, medially concave.

The mandible displays no Meckelian groove, and the splenial is small. The small angular is only visible on the internal side of the ramus. Surangular and articular confluent. Coronoid large, triangular, not concave below, and overlaid at base externally by anterior extremity of surangular, anteriorly not extended over dentary. Angle short, longer than wide, a little inflected, simple; its plane an angle of 45° to that of the ramus.

The hyoid apparatus is very simple. It consists of a glossohasihyal cartilage which is deeply bifurcate posteriorly. At the posterior extremity each posterior limb sends a process *forwards*, which is about half as long as the anterior elements, the hypohyal. No ceratohyal nor second ceratobranchial. A rather short and simple osseous first ceratobranchial on each side.

The vertebral column consists of many cervico-dorsals and a relatively small number of caudals. The second vertebra has a strong keel-like hypapophysis, which is also strong on the third, but which diminishes from that point so that on the sixth it is no longer perceptible. The first rib is short and is attached to the third vertebra. Diapophyses and neural spines very short. The ribs do not display a vertical process at the head as in *Lepidosternum octostegum*. Diapophyses very short and simple on caudal vertebræ. Caudal hypapophyses commencing on the anterior fourth of the caudal series, at first the halves widely separated. They soon converge downwards, and finally touch, but are never coössified to form a chevron. Position on the middle of the length of the centrum. Rib-bearing vertebræ without trace of zygosphen.

Scapular arch absent. Pelvic arch represented by a single curved rod on each side of and anterior to the vent, which is connected with the extremities of two ribs by ligament only. This is the ileopectineal bone of Fürbringer. No trace of posterior limb.

Teeth simple, conic; situated on premaxillary, maxillary and dentary bones only. Premaxillary with but one, a median tooth.

The genus Lepidosternum, as typified by the *L. octostegum*, differs from Rhineura in that the nasal bones are excluded from the narial borders by the maxillary, and from contact with each other by the prolonged spine of the premaxillary. In both of these points Rhineura agrees with Amphisbæna. In Lepidosternum also there is a Meckelian groove, and the angle is turned vertically downwards. In *Amphisbæna* (*fuliginosa*) there is a groove and no angle.

Plate II

Figs. 1-3. *Feylinia currorii* Gray; × 3: from Gaboon, West Africa; specimen in Museum Academy Natl. Sciences, Philadelphia.

Fig. 1 Skull, three views, 2, skeleton of pectoral region, 3, skeleton of sacro-pelvic region

Fig 4. *Anniella pulchra* Gray, skull, × 3; from San Diego, California; from specimen in my private collection presented by Mr. James S. Lippincott.

Fig 5 *Rhineura floridana* Baird; skull, × 3, from Volusia, Fla.; from specimen in my private collection from Mrs. A. D. Lungren.

The principal characters of the osteology of the Feylinia and Anniella are described in Proceeds. Academy Philadelphia, 1864, pp. 228-230, and the pelvic arch of the latter and of Rhineura in a paper now in press in the *American Journal of Morphology*. Additional characters of all the above forms are described in the preceding pages.

Lettering.—*Pmx.*, premaxillary, *N*, Nasal; *F*, frontal; *P*, parietal; *So*, supraoccipital; *Mx.*, Maxillary, *Prf*, prefrontal; *L*, lachrymal; *J*, jugal, *Pof.*, postfrontal; *Pob.*, postorbital; *Pofb*, postfrontoörbital; *St.*, supratemporal, *Pao*, paroccipital; *Eo*, exoccipital, *Os.*, orbitosphenoid, *Pop.*, postoptic; *Epy*, epipterygoid; *Pe.*, petrosal; *Q.*, quadrate, *St*, stapes, *V*, vomer, *Pl.*, palatine, *Py*, pterygoid, *Ecp.*, ectopterygoid; *Sp.*, sphenoid; *Bo.*, basioccipital; *Art.*, articular, *Co.*, coronoid; *Ang.*, angular; *Spl.*, splenial; *D*, dentary.

Plate III.

Hyoid bones of Lacertilia.

Fig. 1. *Sphenodon punctatum* Gray; nat. size; from specimen presented by Sir James Hector.

2 *Chamæleon* sp.; from Cuvier, nat. size.

3. *Gecko verticillatus* Laur.; nat. size, from Cuvier.

4. *Aristelliger præsignis* Hallow.; nat. size.; dissected and drawn by Dr. E. H. Galt.

Fig. 5. *Phyllodactylus tuberculatus* Wiegm ; × 2, dissected and drawn by Dr E. E Galt

6. *Thecadactylus rapicaudus* Houtt., × 2
7. *Eublepharis elegans* Gray ; × 2, Dr. Galt.
8. *Eublepharis variegatus* Baird, × 2.
9. *Calotes cristatellus* Kuhl ; nat. size.
10. *Phrynocephalus mystaceus* Pallas ; nat. size.
11. *Uromastix hardwickii* Gray, nat. size ; from the Zoölogical Garden of Philadelphia.
12. *Holbrookia maculata* Gir, × 2 ; from specimen from Otto Lerch, San Angelo, Tex

Plate IV

Fig 13. *Phrynosoma coronatum* Blv., × 3, Dr Galt.

14. *Sceloporus undulatus* Daud., × 2.
15. *Uta stansburiana* B & G, × [illegible]
16. *Sauromalus ater* Dum, nat. size.
17. *Crotaphytus wislizenii* B & G., × 2
18. *Anolis carolinensis* D & B ; × 2
19. *Ctenosaura teres* Harl, nat size (not adult)
20. *Iguana tuberculata* Laur ; from Cuv. ; nat. size.
21. *Anguis fragilis* L. ; × 4, from Northern Italy
22. *Dracæna guianensis* Daud. ; nat. size, from specimen from Zoölogical Garden, Philadelphia

Plate V.

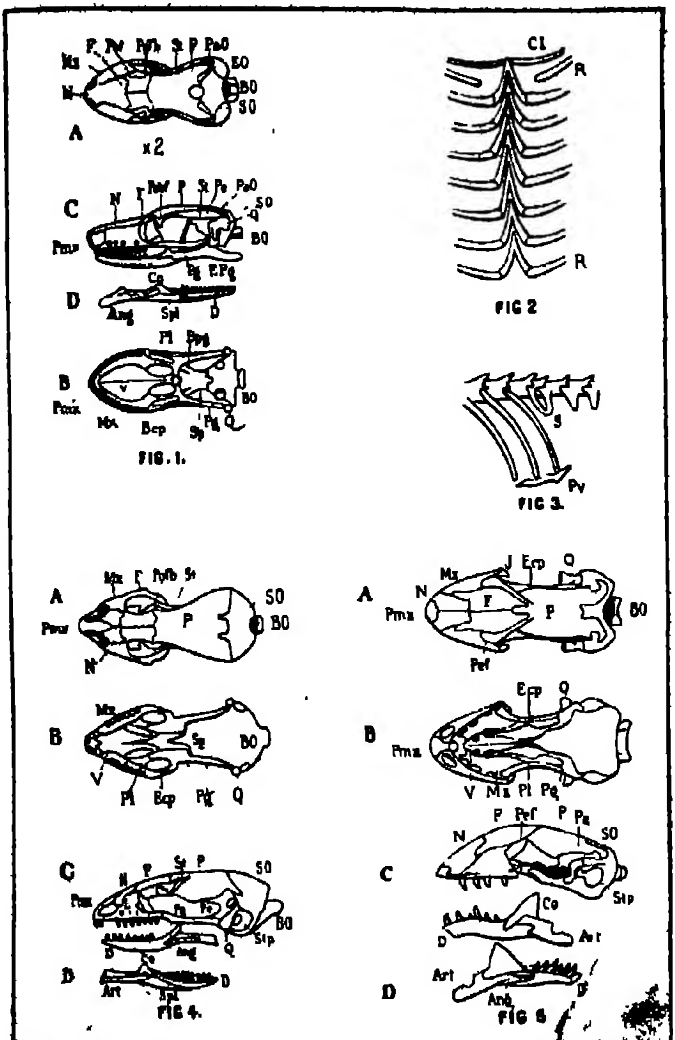
Fig. 23. *Gerrhonotus multicarinatus* Blv, × 2 ; Dr. Galt.

24. *Ophisaurus ventralis* Daud, × 2, Dr Galt.
25. *Heloderma suspectum* Cope ; nat. size ; Dr. Galt.
26. *Lepidophyma flavomaculatum* Dum, three times nat. size.
27. *Varanus niloticus* Linn, nat. size ; Dr Galt.
28. *Scincus officinalis* Laur : × 2 ; from Cuvier.
29. *Eumeces fasciatus* L. ; × 3, Dr. Galt.
30. *Oligosoma laterale* Say, × 2, from Hidalgo, Mexico (*O gemmingeri*)
31. *Gongylus ocellatus* Forsk., [illegible]
32. *Egernia cunninghamii* Gray ; nat. size, the ends of the ceratobranchials are cut off in the specimen

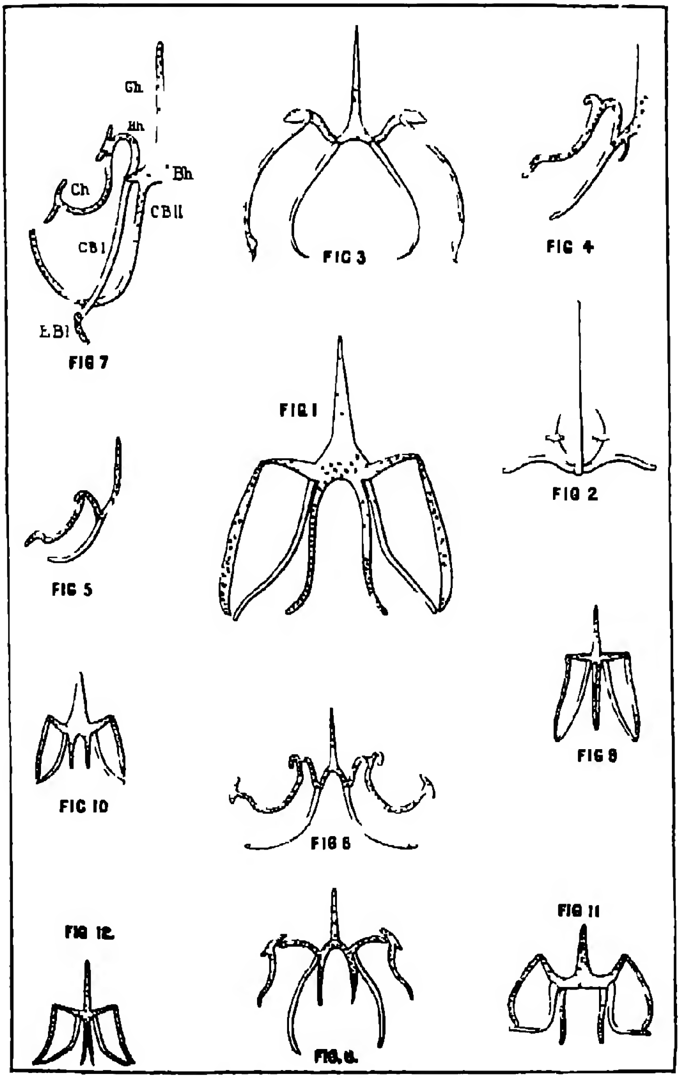
Plate VI

Fig. 33. *Celestus striatus* Gray ; nat. size.

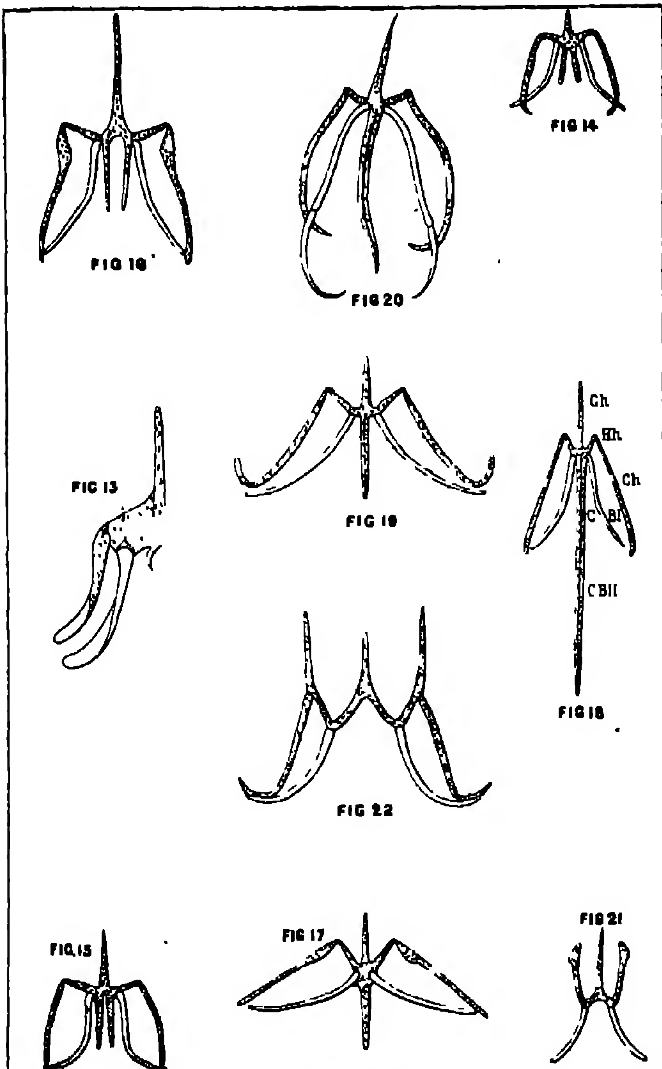
34. *Lacerta ocellata* Daud., nat. size.
35. *Psammodromus algirus* Linn., × 2.
36. *Zonurus cordylus* Linn., × 2
37. *Gerrhosaurus nigrolineatus* Hallow. ; × 2



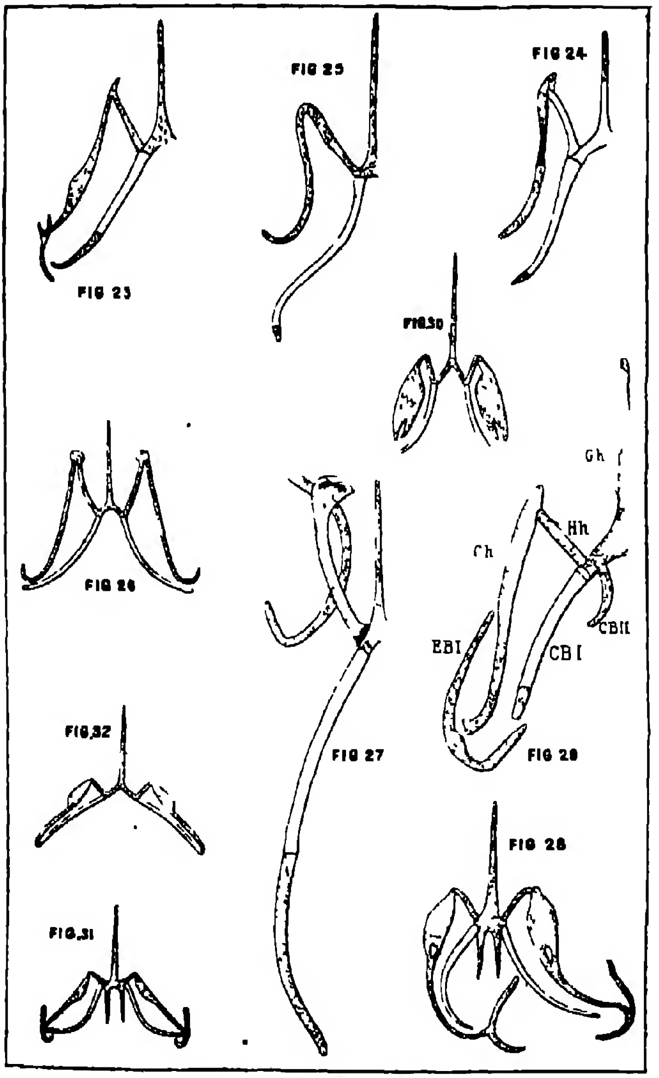
1–3, *Typhline cuvierii.* 4, *Anniella pulchra.* 5, *Rhineura floridana.*



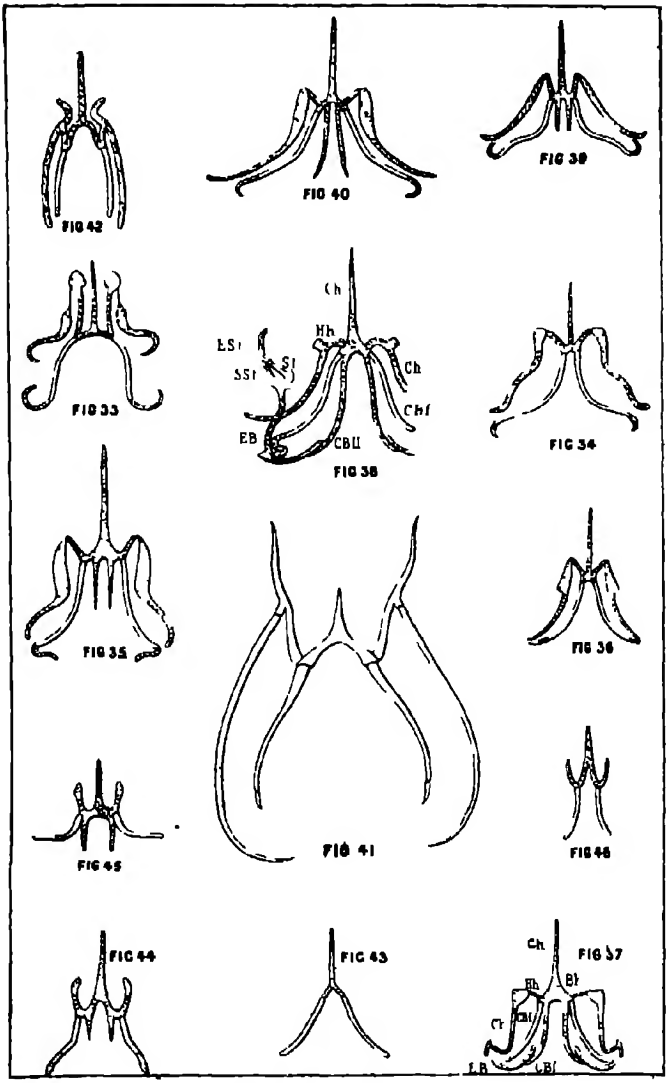
Rhiptoglossa Acrodonta Iguania.



Iguania Diploglossa.



Dysglossa Thecaglossa Leptoglossa



Leptoglossa Annulati.

Fig. 38. *Mancus macrolepis* Cope, × 8
39. *Cnemidophorus tessellatus* Say, × 2
40. *Tupinambis teguexin* Daud, nat. size, from Cuvier
41 *Xantusia riversiana* Cope, ½ nat. size.
42. *Anniella pulchra* Gray, × 4, from specimen from James S. Lippincott.
43. *Chirotes canaliculatus* Bonn, × 4.
44. *Amphisbaena alba* L., ½ nat. size
45 *Rhineura floridana* Baird, × 4

Lettering—*Gh.*, glossohyal; *Bh.*, basihyal, *Hh.*, hypohyal, *Ch*, ceratohyal; *CB I*, first ceratobranchial, *CB II*, second ceratobranchial, *Eh.*, epihyal.

On Some New and Little Known Paleozoic Vertebrates

By E D Cope.

(Read before the American Philosophical Society, April 1, 1892)

It has been long known that the Catskill Chemung beds of Northern Pennsylvania contain a fish bed rich in specimens. This deposit has been traced from Warren, on the west, to Susquehanna county, inclusive, on the east. It is now known that at the close of the Chemung epoch, as at the close of the Devonian in Belgium and Scotland, land emergences took place, producing more or less continued brackish and fresh-water conditions. The latter received the deposits known as the Catskill in the Eastern United States, and these alternations with Chemung beds containing Chemung invertebrate fossils are now well established as facts of our geological history A recent visit to Tioga and Bradford counties, in Pennsylvania, has recently afforded me the opportunity of inspecting some of the localities where vertebrate fossils occur These have been already referred to by Prof J S Newberry in his work on the Paleozoic fishes of North America. Guided by two geologists residing in the regions in question—Mr Andrew Sherwin, of Mansfield, Tioga county, and Mr A. T. Lilley, of Leroy, Bradford county—I had an excellent opportunity of observing the mode of occurrence of the fossils and of obtaining specimens. I wish here to express my particular indebtedness to these gentlemen for the aid they have rendered me.

The locality I visited, near Mansfield, is typical Catskill. The list of species obtained is not large. They are:

Bothriolepis nitidus Leidy
Holonema rugosa Clayp.
Ganorhynchus oblongus, sp nov
Osteolepis or *Megalichthys*, fragments.

Holoptychius americanus Leidy.
Holoptychius giganteus Agass.

From Chemung beds near Leroy I obtained .

Holonema rugosa Clayp.
Holonema horrida, sp. nov.
Holoptychius filosus, sp nov

From another locality, probably Chemung, near Leroy :

Bothriolepis minor Newb.
Cercosteus macromus, sp. nov.
Osteolepis or *Megalichthys*, fragments.

At the last-named locality the specimens are very abundant, but mostly dissociated, so that it is rarely that two pieces of the same fish are found in their natural relations. The bed where they occur is in some places carbonaceous from the abundant organic matter deposited there. Fragments of the Osteolepid fish above referred to are abundant, but they are too scattered for identification.

To the species found in Pennsylvania, I add the description of a fine Megalichthys from the Carbonic of Kansas.

OSTRACOPHORI.

HOLONEMA HORRIDA, sp. nov.

This large species is represented by the nearly perfect mold of a plate whose position may be determined by the following considerations. It has almost exactly the form of the lateral plate of the specimen of the *Holonema rugosa* Clayp., to which I referred in describing the supposed pectoral spine of that species.* From the fact that the specimen referred to presents two median scuta, I have supposed that it is a part of the carapace. It is, however, true that the exposed surface of the long anterior median plate is acuminate in front, showing that the anterior lateral plates join anterior to it. This is not known to occur in the carapace, but is characteristic of the plastron. That this conclusion is correct is shown by the character of the median posterior scute of *H. rugosa*, shortly to be described. This being the case, it is necessary to admit that there are two median scuta, a character thus far unknown in the Antiarcha, and one which distinguishes the genus Holonema from Bothriolepis.

On this interpretation, the scute to be described is the posterior lateral of the left side of the plastron. It is about three-fifths the size of that of the *Holonema rugosa* and is considerably longer than that of the *Bothriolepis nitidus* Leidy. It differs from both species in its superficial sculpture. In the last-named species this is generally concentric to a non-central point. In the *Holonema rugosa* the sculpture radiates from a more or less central point. In the present species the pattern is longitudinal

* Proceedings U S Natl Museum, 1891, p. 498.

from end to end of the plate. The anterior part of the external border of the plate is present in the rock mold, so that a cast of its surface was not obtained; but, with this exception, the cast is nearly complete. On the middle of the plate, commencing at the anterior extremity, the ridges are least interrupted. Anteriorly they are oblique or slightly imbricate, looking outwards, and are connected at longer intervals, near the inner border, but little connected. Posteriorly they are more direct and are more frequently joined by transverse connecting ridges. Near the middle of the external region the ridges so inosculate as to produce a non-linear arrangement of round pits. On the inner side of the plate the sculpture is finer and is longitudinally honeycombed.

	M.
Total length of plate	190
Width at middle	60
Length of anterior internal border	90
Length of posterior internal border	47

In the roughness of its surface this species exceeds those that are known to belong to the Antiarcha.

Chemung bed, Bradford county, Pa., A. T. Lilley.

Holonema rugosa Clayp.

Newberry Paleozoic Fishes of N. Amer., 1889, p. 99.

Pterichthys rugosus Claypole, Proceeds. Amer. Philosophical Soc., 1883, p. 664.

Fragments of the exoskeleton of this species are common in the Chemung beds, and they are generally of large size, much exceeding that of any other species of the Bothriolepididæ. They are generally so much broken as to render their location difficult. I obtained from Mr. Lilley a number of fragments of such a plate which, on reconstruction, proves to belong to the posterior median dorsal plate, enough of which remains to give a good idea of its form and sculpture. The anterior margin only is entirely wanting.

The plate is obtusely rounded at the median line, giving an obtusely roof-shaped form. It is relatively rather narrow anteriorly, and widens gradually to the posterior border, where it is also flatter. The edges (lateral and posterior) are rather thin, and the lateral are obscurely beveled below, as though to overlap the lateral posterior plates. The middle line below is openly grooved on the anterior half, while a longitudinal thickening marks the middle line of the posterior fourth below. The inferior surface is smooth, while the superior surface is sculptured with the parallel grooves characteristic of the species. These grooves extend to the lateral and posterior borders. The median ones are longitudinal and without interruption throughout the length of the fragment. Those on each side of the middle line diverge slightly and reach the margin, the lateral at an acute angle as far forward as the middle of the length of the

fragment. From this point forward they diverge in a direction gradually approaching and thus reaching a right angle with the margin. The transverse grooves form a band which increases in width anteriorly until it is nearly one-third the width of the plate in front. The grooves are fine and are separated by interspaces wider than themselves. They become coarser anteriorly, the interspaces measuring 1.5 mm.; posteriorly they measure 1 mm.

The middle line above shows some unsymmetrical low tuberosities which do not correspond to cavities on the inferior side. The plate is generally thin.

Measurements.

	MM.
Length of fragment	228
Width of plate at front of fragment	110
Thickness of plate at front of fragment	5
Width of plate at posterior border	120

This piece, together with the pectoral limb which I have already described, demonstrates the position of the genus to be with the Antiarcha, and not with the Arthrodira, as has been suspected by Mr. A. S. Woodward.

Chemung, Bradford county, Pa., A. T. Lilley.

BOTHRIOLEPIS MINOR Newb.

Paleozoic Fishes of North America, 1889, p. 118; Pl. xx, Figs. 6–8.

Fragments of this species are exceedingly abundant in the Chemung rocks in Bradford county, but generally dissociated. The examination of a large number of these demonstrates the correctness of the generic references made by Prof. Newberry. The most abundant pieces are the lateral ventral plates, the anterior median dorsal plate, and the median occipital. The latter sometimes remains in conjunction with the plates on either side of it.

These specimens are unaccompanied by any trace of scales or fins, thus agreeing with other species of the genus. There is also but one median abdominal plate, showing that the *B. minor* is not to be referred to Holonema. One of the characters of the species is seen in the fact that the sensory grooves of the median occipital plate do not extend to the smooth articular border, but are separated from it by a band of sculpture. The premedian plate is crossed by a groove which presents an abrupt loop backwards at the middle. The species always remains much smaller than the *B. nitidus* Leidy (*B. leidyi* Newb.).

Leroy, Bradford county, Pa., A. T. Lilley.

DIPNOI.

GANORHYNCHUS OBLONGUS, sp. nov.

Established on what is either the symphyseal element of a mandible, or a median bone of the superior mouth-arch. It consists of an oblong trough-shaped plate with a thickened, somewhat revolute border, which is concave in two directions, that is, in the direction of the concavity of the trough, and as a concavity of its free margin. This form indicates that it occupied an oblique position, like the elements mentioned, so that the thickened surface should fit closely the corresponding elements of the opposite jaw. There is no enamel covering the masticatory border, but this may have scaled off. There are no lateral denticles as in the Holodus of Pander. As compared with the *G. beecheri* of Newberry, this bone has the length relatively much greater as compared with the width. The width in that species exceeds the length several times, while in the *G. oblongus* the width but slightly exceeds the length. The concavity of the masticating border is greater; the size is very much less. As compared with the *G. woodwardii* Traqu., this species is very much smaller; there are no "nareal" notches; and no tubercles on the edge.

The sides of the body of the bone are nearly parallel, and the posterior border is gently convex. Two layers are visible; the interior one, like the external, has a coarsely punctate surface.

		mm.
Length	at middle	9
	at border	10 5
Width	at proximal extremity	8 5
	at masticatory extremity	13.5

From near Mansfield, Tioga county, Pa.; from the Catskill formation. From Andrew Sherwin.

TELEOSTOMATA.

COCCOSTEUS MACROMUS, sp. nov.

Fragments of this species are abundant in the Chemung rocks at Leroy, and I select as typical of it a pair of supraclavicular and adjacent pieces, which display its characters best. The supraclavicle has lost the condylar articulation. Both extremities display the unsculptured surface, and the usual groove extends obliquely across the sculptured portion at about two-fifths the length from one of the extremities. The sculpture consists of obtuse tubercles with delicate radiate-grooved bases, which are usually separated by spaces equal to their own diameters, sometimes by narrower spaces, but never by spaces which are wider. At some points they have a linear arrangement. This sculpture is coarser than in the *C. americanus* Newberry (see the Paleozoic Fishes of North America, by this author), but resembles that of the *C. decipiens* Agass. of Scotland. From this species the *C. macromus* differs in the elongate form of the supraclavicle,

which is relatively short and wide in the *C. decipiens* (see Agassiz, in the Poissons de la Vieux Grès Rouge, and Zittel, Handbuch der Palaeontologie).

	MM.
Length of supraclavicle	36
Width just above condyle..............	10

Associated and in contact with these pieces are two acuminate oval bones which may be opercula. Each is pierced by a groove They display the inferior side, which is smooth.

MEGALICHTHYS MACROPOMUS, sp. nov

Established on the greater part of an individual from the Carbonic system of Kansas With the exception of a short interval just behind the head, the specimen is complete as to its length; the pectoral and ventral fins are damaged, and the extremity of the anal is broken off. The scales of one side of the body only are visible in the present state of the specimen, and a good many of those of the abdominal region are lost.

The general characters may be enumerated as follows. The form is slender. The scales are large and rhombic, with rounded extremities. The supratemporal (cheek) bones and opercula are very large, and are much extended posteriorly. The enamel is present on the superior aspect of the skull in small and irregular patches only, but it covers the rest of the external surfaces. It is everywhere closely and minutely impressed-punctate. The bones of the skull are thin and light.

The elements of the skull are distinguishable for the most part, the sutures being obliterated on the nasal region. The pterotics (squamosals Traquair) are longer than the postfrontals, and the parietals are longer than the frontals. The supratemporals (cheek-bones Traqu.) are very large, extending posterior to the posterior border of the parietals. The intercalaria are large (supratemporals Traqu.). The opercula are very large, and in this specimen they are shoved upwards so as to overlap at the median line. Their length enters the total length of the skull, three and a half times, and is a little greater than that of the parietal bones. Their superior margin is beveled off from a low longitudinal thickening, from which some low wrinkles radiate downwards. Enamel is present on the superior surface of the skull, on the border of the frontal bone posterior to the orbit, and on the anterior part of the postfrontal bone. There are grains of enamel scattered on the parietals. On the supratemporals there are closely placed concentric interrupted lines on the superior part, and irregular patches of larger size on the inferior part. There are large patches of enamel on the opercula. The superior bones of the skull are everywhere roughened with minute tuberosities, which fuse into transverse ridges on each side of the sagittal suture. The maxillary bones are displayed partly on the superior, partly on the inferior faces of the specimen. They are rather slender, and their distal extremities are broken off.

There is a short pyriform symphyseal, entirely enclosed by the mandib-

ular rami, and a median gular bone which joins the gulars with a concave suture. The gulars are large, and measure three times as long as wide at the middle. They are cut off obliquely on the inner side posteriorly, by the chevron-shaped arrangement of the pectoral scales. Several large external gulars. The posterior extremities of the mandibles are broken so that their proportions cannot be exactly ascertained, but the length preserved is six times the width opposite the anterior gular. The surface of their inferior portions is marked by coarse impressed punctures besides the usual minute ones. The former are not present on any other part of the fish.

The scales are large; between the bases of the pectoral and ventral fins can be counted about twenty-one rows, and between the ventral and the first dorsal immediately above, eight rows. The first dorsal fin is above the ventral, and the second dorsal above the anal. There are two large scales on each side which embrace the base of the first ray of the first dorsal and anal; the other fins are too imperfect at the base for description. The caudal fin is shortly heterocercal, and there are six broad fulcral scales protecting the side of its inferior border. In all the fins the rays are segmented. A half dozen rays near the border are coarse, but the remaining rays are finer. In all the fins the coarse rays are distally subdivided.

Measurements.

	mm.
Total length of specimen (90 mm. intercalated behind head)	930
Length to anterior border of orbits	45
Length to posterior border of parietals	143
Length to posterior border of operculum	230
Length to anterior base first dorsal fin	630
Width between orbits	38
Width of parietals + postfrontals anteriorly	66
Width of parietals and pterotics posteriorly	75
Length of symphyseal bone	18
Length of anterior gular	18
Length of gular	190
Length of first dorsal fin	110
Length of caudal from inferior base to superior free apex	185
Depth of body at first dorsal	85
Depth of body at second dorsal	80

This species is not nearly allied to the species from the Permian of Texas, the *M. nitidus* Cope, which is smaller and more robust in form. It has its scales and ganoine, generally, perfectly smooth, and there are but fourteen rows of scales between the pectoral and ventral fins. From the European species with punctate ganoine it differs in the longer gular bones and more elongate head, so far, at least, as concerns the *M. hibberti* and *M. laticeps*. In *M. pygmaeus* the scales are described as coarsely punctate by A. S. Woodward. Its dimensions are about equal to those

of the *M. hibbertii.* The crescentic ganoine scales of the muzzle of that species and the *M. nitidus* are absent from the *M. macropoma.*

I owe the opportunity of examining the beautiful specimen which is described above to my friend, Mr. R. D. Lacoe, of Pittston, Pa., whose collection of Paleozoic fossils is so valuable, and has been of such utility to students of the subject.

(?) Holoptychius pilosus, sp. nov.

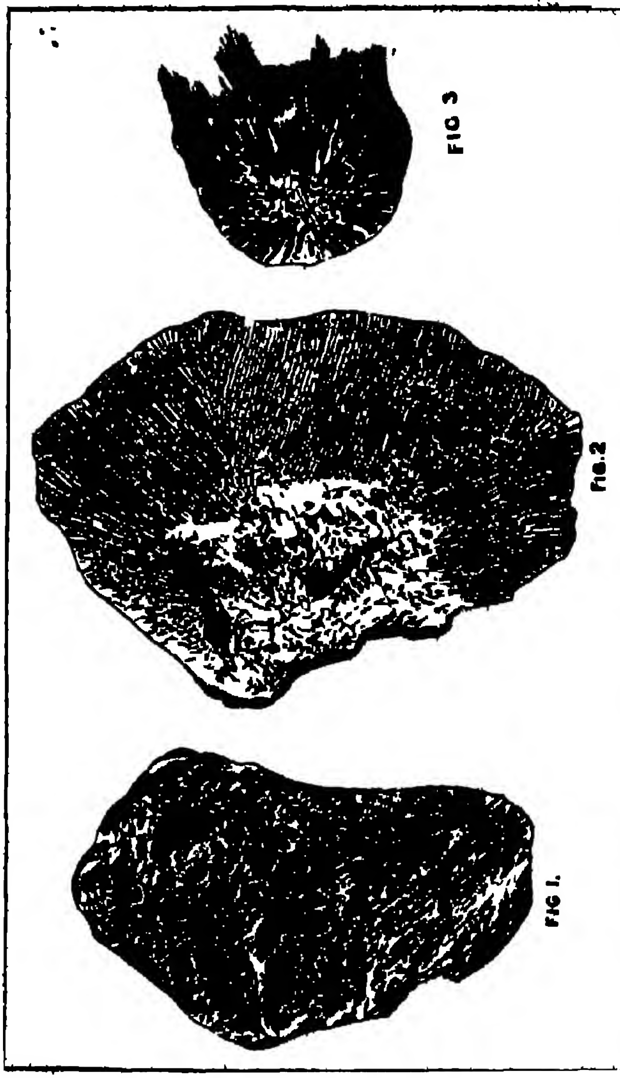
Represented by a large scale which has a peculiar and characteristic sculpture. But a small part, if any, of the proximal border is smooth. There is an area of coarse tubercles whose centre marks the proximal fourth of the long diameter, and whose vertical diameter somewhat exceeds the longitudinal. From this area there radiate in all directions to the circumference, ridges, of which the proximal are very coarse, but which become finer to the posterior side of the central area. The longer and finer ridges divide dichotomously at various points as they approach the border, the division being most conspicuous in two lines above and two below the longitudinal middle line. The ridges are quite fine and are separated by spaces rather wider than their diameter, except proximal to the area, where the reverse is the case.

This species is represented by a mold from which a cast has been made. The distal border is evidently thin, and has been more or less broken, so that its outline is not certainly known. The following longitudinal measurement may, therefore, require revision at some future time.

Diameters of scale	longitudinal	(?)66
	vertical	65
Diameters of tubercular area	longitudinal	10
	vertical	15
Width proximal to area		9
Five distal radii in		5

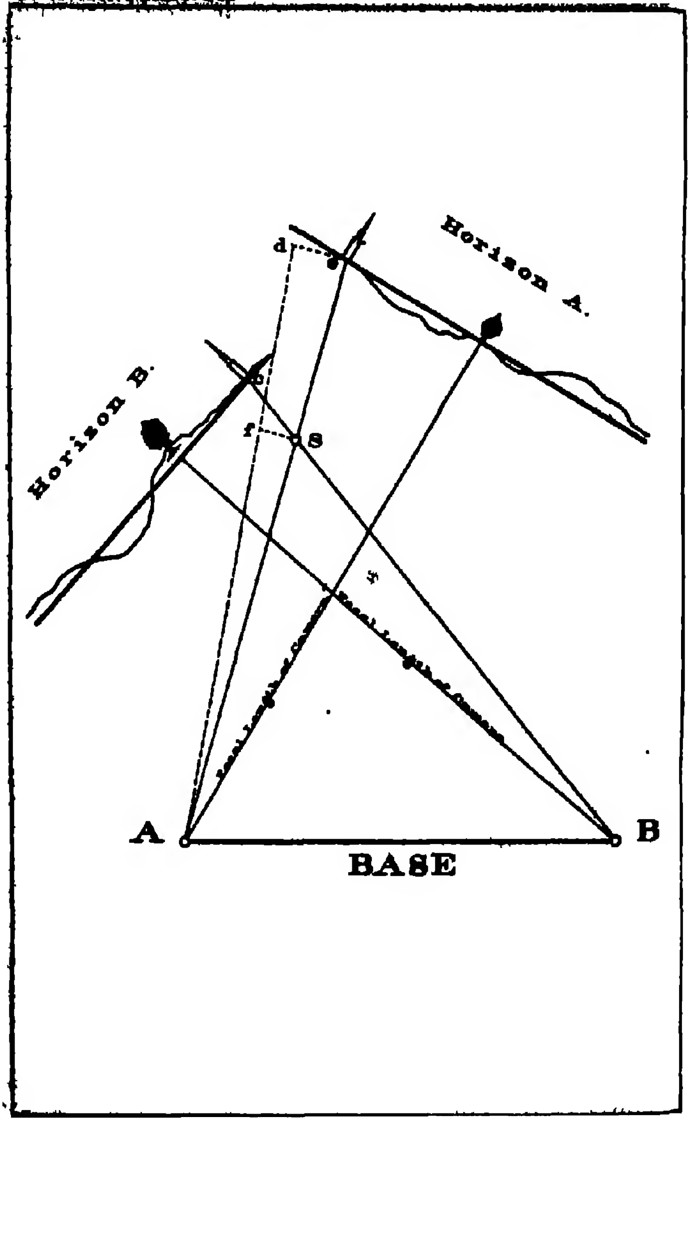
It will be observed that this is the equal in dimensions of the largest species of Holoptychius known. Its sculpture serves to connect the species of the *H. nobilissimus* type with those of the group Glyptolepis. The apparent absence of proximal smooth border may be due to accident, as the border is not complete; but it is, in any case, narrower than in the known species.

From the Chemung beds of Leroy, Bradford county, A. T. Lilley, I have, like Prof Newberry, obtained the *H. americanus* Leidy, and the *H. giganteus* Agass., from the Catskill beds of Bradford county, Pa., through Mr Andrew Sherwin, to whom I am under many obligations.



1. *Holonema horrida.* 2. *H. rugosa.* 3. *[illegible]*

Megalichthys macropomus Cope.



Horizon A.
Horizon B.
d
f
S
A
B
BASE

Explanation of Plates.

Plate VII.

Fig. 1. *Holonema horrida* Cope; lateral ventral plate, two thirds natural size.

Fig. 2. *Holonema rugosa* Claypole; lateral ventral plate, one half natural size.

Fig. 3. *Holoptychius flosus* Cope; scale; two thirds natural size.

Plate VIII.

Megalichthys macropomus Cope; skull from above, about three-fourths natural size; from the collection of R D Lacoe

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Civil and Military Photogrammetry

By R. Meade Bache.

(*Read before the American Philosophical Society, May 6, 1892.*)

Photogrammetry is recognized as a legitimate mode of surveying. It is, in fact, if practiced with due regard to the limitations involved through spherical aberration from object glasses of too wide aperture, a mode of surveying of considerable accuracy, although not for a moment to be compared to other perfected modes of the present day. It can never rival these in their sphere, which is the sphere of extreme precision, but at the same time it must be admitted that, within its own, it is capable of doing good service.

The diagram on the blackboard has been made as simple as possible, to illustrate the mode of obtaining a single vertical and a single horizontal determination. It is evident, however, that the sectors of horizon and intervening landscape belonging to each picture, assumed to have been taken from the respective stations, *A* and *B*, might be filled with objects. Many of these, from the fact of their having been visible from both stations, would be determinable by this method of cartography.

AB is a base to serve for the determination of some of the details of a survey. The optical axis of the camera being set at each station respectively upon a prominent, distant object, say a lone tree, the angle at each station between the base and that object is taken.

The rays of light cA and cB, respectively, proceed from a steeple to the photographic points of view A and B. The intersection of these rays at S gives, according to the scale of the plotted base, the horizontal position by scale of the steeple with reference to those points of view.

In deference to a misunderstanding of which I heard lately, as to the relations of the horizons to each other, as represented in this diagram, I shall endeavor to preclude it now by calling attention to the fact that the horizons are here laid down as to direction, but in order to secure the utmost simplicity in the diagram, not as to their possibility of lateral extension. Objects, for instance, in the middle distance of the steeple, as seen in elevation on horizon A, from station A, would, at station B, fall to the left of the steeple, as seen in elevation on horizon B. Conversely, objects in the general direction, and in the background of the steeple, as seen in the elevation on horizon A, from station A, would fall to the right of the steeple, as seen in elevation on horizon B, from station B.

The chief method of photogrammetry in use at the present time is illustrated by this diagram, and is based on very simple principles. The angles and distances obtained in ordinary surveying are merely natural or artificial selections. They are merely arbitrary subdivisions of space, convenient selections from an infinite number of similar elements. But it is also true that, the relations of a few of those elements being judiciously selected and determined, all others secondarily deduced fall into harmony with them. The photographic camera, however, as compared with other surveying instruments, does not lend itself at first to selection, but giving all visible nature from various points of view, enables the employer of it finally to make his selection from the resulting pictures, as if from nature itself.

From all points of view, then, angles and distances exist in nature, and although they apparently change, as the observer changes place, the correspondences among them, as seen from all points of view, are perfect. Hence, if we delegate to the photographic camera the duty of making a permanent record of nature, as seen from two or more points of view, the intersection of the rays of light, reaching those points of view respectively from the same objects, as pictured in photographs properly placed, will, by their intersection on paper to become a map, give the positions of

those objects relatively, as plotted, to the points of view and to one another.

Occupying with a photographic camera the points formed by the termini of a base line on the surface of the earth, having on its photographic plate imaginary vertical and horizontal lines, susceptible of being developed into real ones, the intersection of these lines corresponding with the centre of the prospective picture (the former enabling the operator to set the camera accurately to any horizontal direction, the latter giving, when the camera is leveled, the horizon for each picture), the camera is fixed in turn at the two stations upon some distant determinate object by its line of sight, its position being otherwise so adjusted that the objects to be determined in the landscape, within a given sector of the horizon, shall appear on the picture as taken from each of the two stations. The azimuth of the base line, and of the lines of sight from it, being determined by the theodolite, field transit, or compass, the survey for a particular sector of the horizon at the two stations lacks but one factor to make it complete, as soon as the pictures shall have been taken by the camera. The camera has given, by its occupation of the two stations at the ends of the base line of assumed length, only one portion of the data necessary to constituting a survey, namely, the angles subtended in nature by the various objects which come within the scope of both resulting pictures. A very simple addition, however, suffices to make the survey complete. To secure that, to introduce the element of scale, it is necessary to know the length of the base line. The scale to which the base line is plotted on paper becomes, then, through the acquisition of knowledge of the length of the base on the ground, the scale of the whole resultant map; which, it should be incidentally noted, must range by scale no further from each station than to a distance where rays of light to the two stations give good graphical intersection, the extent of the range by scale being conditioned upon the length of the rays by scale relatively to the length of the base line by scale.

Not only do rays proceeding from the same object, as introduced on two pictures properly placed, give by their intersection the horizontal position by scale of the object with reference to the base, but the angle subtended on any pictorial horizon by two objects, as seen from the properly plotted point of view of that horizon, repre-

sents on a map the actual visual angle as seen from that point of view in nature. In fact, the latter truth is that which is in nature the fundamental one in this connection. It is axiomatic that the visual angles in nature between all objects whatsoever, as projected on a given sector of the horizon, as seen by the eye of the observer, or that of the camera, from a given point of view, are the true angles between those objects, and that their sides, converged at the point of view, represent the true directions of the rays from those objects, corresponding with a base in nature with reference to which their angles are either directly or indirectly, in this case indirectly, known. Therefore it is because, in a *single* picture, the angles between different objects, in fact between all objects there, at the distance of the focal length of the camera, as seen in the picture from its plotted point of view, are the same as in nature from its point of view, that the intersection of rays from the same object, as seen on *different* pictures, placed in position corresponding with the way in which the landscape was photographed from nature, must represent by scale the horizontal position of the object as it stands in nature. That is to say, if what we see from one point of view in nature is true by angle, and also by angle true, although different, as seen from another point of view in nature, then the intersection of the individual rays, by means of which we have seen the objects in their angular positions with reference to each other, must represent their true horizontal positions with reference to the base which we have traversed between our respective points of view. And if this holds good with respect to nature, it must hold good with respect to corresponding pictures of nature, placed horizontally with relation to each other as nature had presented itself from those individual points of view from which the pictures were taken. The result, expressed as a surveyor would state the case, depends upon the fact that, if a point lies somewhere on a line, and also somewhere on a line intersecting the other, then the point will be at the intersection of the two lines. In this case the two lines are simply the visual rays, shown in the respective pictures, in the positions and with the angular effects as seen in nature, intersecting each other on their passage to the respective points of view.

In practice, a round of pictures, each taking in a certain sector of the horizon and intervening landscape, and slightly overlapping one another, is made to cover the tract of which it is contemplated

to execute a survey, and the area comprised by them is pictorially duplicated from one or more stations. It is always desirable that the same objects shall be seen, if good intersection of rays can be secured from the different pictures, from three stations instead of two, because an error in one of the azimuths at the end of a single base, which of course gives only two lines for an intersection of rays, would vitiate a whole survey, whereas, with two bases, involving three points of view, and the intersection of three rays, accuracy throughout a survey receives a crucial test. The adoption of this plan, which is like that employed in ordinary triangulation, is also desirable on account of its securing accuracy of plotted results; because graphical differences in the positions, as given by the intersection of only two lines, are virtually eliminated by obtaining for intersections the mean positions as derived from three lines.

The survey, so far as the instrumental part of it is concerned, being complete, it only remains that the plotting of it shall be done. The base line being laid down to scale on paper, lines are drawn from its termini, at the angles with it represented by the azimuths of the lines of sight as determined there on the ground. On this representation on paper of the lines of sight, at the respective plotted stations, are placed, at right angles, printed on thin paper, the photographs taken at the twó stations, in such manner that the individual plotted line of sight shall point on the photograph upon the representation of the object upon which the real line of sight was directed in nature, after that representation shall have been vertically projected on the horizon line of the photograph, and that the horizon line of the photograph shall be distant from the individual plotted station by the focal length of the particular camera that was used in taking the pictures. The eye then, placed in position over a plotted station, and looking at a photograph corresponding to the view taken from that station, sees, as already demonstrated, that view under precisely the same angular effect as the view is presented by nature on the ground. Consequently, as angles formed by rays of light with the base line are given truly in nature, are also given truly by the camera, and are now given truly as plotted on paper to become a map, the intersection on that paper of these rays, as proceeding from the pictorial representation of the objects from which they are derived in nature, after their pictorial source has been vertically projected on the hori-

zon line of the photographs, will be the positions of the objects on the map, with due relation by scale and angles to the stations of the base line and to one another. The contemplated map will, in a word, be susceptible of being drawn throughout to scale. It is clear that a great number of objects may be thus plotted from two stations representing the ends of a base line, and that if we know the length and azimuth of a base line, and the azimuths of the lines of sight from its termini, the elements of scale and orientation will inhere in all the resulting work that goes to form a map. Used for the function described, the photographic camera is therefore very aptly called the camera-theodolite.

Adopting the same diagram to illustrate the mode of determining height by the camera-theodolite, we see the steeple, as observed upon from the point of view A, having the ray eA coming from the photographic position of the steeple as projected on the horizon line of the photograph taken from A. Draw from the point e the height of the steeple, as derived from the photograph taken from A, perpendicularly to the ray eA, and draw also the hypothenuse Ad. Any one intuitively perceives that the pictorial height of the steeple being ed at e, at the end of the focal length of the camera, its height at S, the horizontal position by scale of the steeple, must be Sf, and that that by scale is the true height. The length of the line Sf may therefore be obtained numerically by applying to it the scale of the base, which may be the scale of a whole map. With a greater degree of precision the same result may be reached by computation, because $Sf = AS\frac{ed}{Ae}$, $\frac{ed}{Ae}$ being the tangent of the vertical angle dAe, and AS the distance from the point of view A to the steeple S.

Of course the height of any natural as well as of any artificial object above the plane of the horizon may be ascertained by similar means. A steeple was chosen to illustrate both horizontal and vertical methods of determination, because it affords points that are so conspicuous as compared with those of many other objects that offer themselves to the sight in most surveys.

Surveys from this kind of photogrammetry may be plotted to any scale, within reasonable limits of size, by adopting for the base line of the survey the scale desired. In all cases, however, the photographic pictures must, in order to enable them to present correct angles for the map, be placed in the manner already pre-

scribed, on the respective horizons as plotted on the paper to become a map.

Balloon photogrammetry has been practiced to some extent ever since the invention of the photographic dry plate. This method, however, has belonged rather to the sphere of reconnoissance than to that of surveying. When some prominent objects appear on the landscape, whose geographical relations to one another are known, the balloon photographic product may be of considerable value, if too large a circle has not been included by the camera, and this method indicated, if the desirable conditions are strictly fulfilled, may be utilized to advantage if the resulting map is not required to be of rigid accuracy. When, however, such objects are very remote from one another, even when their geographical positions are known, the spherical aberration resulting from employing a large aperture of object-glass makes a product which cannot be regarded as of high value, one which cannot properly be dignified with the name of survey in the restricted sense of the term, and to which we should prefer to apply the name of reconnoissance. Without adjusted height for the camera, without near objects of known geographical relations to one another, to obtain orientation for the results, without precise regulation of the angular aperture of the object-glass of the camera, nothing can be produced by balloon photographic process that, in the restricted sense noted, merits the name of survey

It is on account of my perception of this low estate of balloon photogrammetry that my attention is especially drawn to devising a method of applying the art upon true principles. By my method the balloon must be captive, not free, and being captive it may be made quite small, easily managed, and inexpensive, thus rendering its employment practicable for ordinary use, especially as, according to the plan sometimes adopted in the case of the military captive balloon (to the consideration of which we shall presently come), the gas requisite for inflating the balloon can readily be carried under high pressure in metallic cylinders.

The traverse line of land surveying is merely a zigzag course, consisting of stations, the angle between each successive three of which, and distance between each successive two, is measured. From these stations details of the terrene are generally procured.

To enable a traverse line to form a portion of a general survey, there must be means adopted to place at least its initial and terminal points in relation to that survey, whereby all intermediate points fall into due relation with it.

This premised, I will now describe how my plan for introducing precision into balloon photogrammetry could be applied in various useful ways for delineations of portions of the earth's surface.

The appliances needed for carrying out the plan are a small spherical balloon capable of supporting a light photographic apparatus, swung in gimbals, and protected from injury in descent by a thin encircling cylinder of metal or of wood. A zone of cord would pass horizontally around the balloon, to which would be attached four equidistant guys of the size of codfish lines. A broad colored stripe would pass vertically around the balloon. From below the balloon would depend reophores enclosed in a graduated cord, the graduation serving the purpose of adjusting the balloon to any given height above the earth. The reophores would be electro-magnetically connected with the shutter of the camera, actuated from the ground by a small, but strong, galvanic battery

The balloon, being inflated, would be compelled, by means of the four equatorially fastened guys, to assume a position regulated as to height by the graduated cord. This height will have been previously determined upon with reference to the scale of the map that may be desired, the focus of the camera having also been adjusted with reference to the contemplated height of the instrument above the earth The position of the balloon would be over the middle of a given link of a traverse line, the orientation of the camera being secured by causing the vertical stripe on the balloon to range along the given link of the traverse line. Two disks, made of hoops covered with white cotton cloth, one of which should be larger than the other, would give on the photograph, points representing the termini of the link corresponding to those on the ground, and the direction in which the link, as a portion of the traverse line, is lying

A very low grade of accuracy could be obtained by the balloon photogrammetrical process by the method of omitting all angular and linear measurements on the ground, and letting the balloon camera, placed in a generalized position with reference to the parts of a traverse line, accomplish the whole work of determining the

angles and directions of the parts of the line successively submitted to its operation, as well as of delineating what it must perforce include by the photographic process in the representation of the details of the subjacent terrene. In this method the end link of a given section of the line would have to be duplicated in the advancing survey of the line, so that the relations with one another of all parts of the line should be maintained. If, additionally, the azimuth of one of the links of the line were obtained, it would communicate azimuth to all the other links. But this method can, at best, be recommended for nothing beyond the requirements of reconnoissance.

The photographing of a link of a traverse line in the precise manner first described involves, of course, the necessity that the balloon and each of the two stations representing the link over the middle of which it is floating, should be intervisible. A similar condition, as between the two stations as viewed on the ground, is indispensable. It is evident, however, that if there are trees or other obstructions on the ground, the stations might be intervisible below, and yet that each might not be intervisible with the balloon. Consequently, as not only these conditions but the condition of ample space for the management of the guys must be fulfilled, precise operations with the balloon imply the existence of open ground, or ground substantially free from obstructions to sight.

In proportion as the balloon is allowed to attain a greater and greater height, so as to include more and more of the earth's surface, the scale of the resultant map would become smaller and smaller, and the apparatus more and more unmanageable, because at a great height the guys cannot be maintained at the angles requisite to control its exact position. Therefore, it will in practice probably be found that heights of from three hundred and fifty to five hundred feet will be those most convenient for surveying by this method.

One gain made by elevation is more than counterbalanced by the loss of the clearness of delineation that belongs to a large scale. It is evident that, at moderate heights, the photographic projection of an abrupt rise of ground or other object, as, for instance, a house, on the plane of the photograph is at a greater distance by scale from the vertical passing through the balloon than it should be as related to nature, but that, as the height of the balloon above the earth increases, this error proportionately decreases. There-

fore, for the moderate elevation that must be adopted for the balloon in order to manage it, we must, with broken surface, accept greater error in delineation than would attach to the same surface if greater elevation of the balloon were permissible. But we should be reconciled to this fact from the consideration that, even were it possible to manage the balloon at the height which would virtually eliminate the error of projection mentioned, the scale of the resulting map would be so small as to approach in character the results of a reconnoissance Another circumstance should reconcile us to the insuperable fact mentioned, and that is that there are thousands of square miles in our country where, from the very fact that the surface is essentially level, the optical difficulty attaching to moderate elevation for the balloon would not exist.

Such a survey, by balloon photogrammetry, as that described could be very easily plotted by final process of photographic printing In consequence of the fact that the balloon would be kept at a fixed height throughout a given survey, the scale of the links of the traverse line would be established through the photographic presentment of the length of those links. The scale of those links may also be fixed by the measurement of them on the ground. So the photographic scale and the other scale may be made the same, and therefore they would be made the same The traverse line having finally been laid down on helios paper, before the paper is sensitized, the paper would then be sensitized, and the photographic plates representing the links of the traverse line would be simultaneously adjusted upon it along the traverse line as plotted, one scale, as derived from adjusting the balloon at a certain height, and the other scale, virtually the same, as derived from linear measurement along the ground, being made to accommodate themselves graphically to each other, thus eliminating error in the resultant map. This resultant map, if the picture of a plane surface, would have but one defect, that of exhibiting minute triangles of blank space where the photographic plates, cut off so as to fit along the links of the plotted traverse line, would necessarily not fill out entirely the delineation of the ground at those points, although otherwise perfecting it elsewhere, from the fact that they would form with one another a continuous series.

The captive balloon, if used only on days fit for ordinary field work, would occupy a position of almost stable equilibrium, if its power of flotation were sufficient, not only to support the photo-

graphic apparatus, but to strain upward upon the controlling guys, because the attachment of the guys would be made to the equator of the balloon, and the weight of the dependent apparatus would be close to its periphery, and therefore to the centre of the spherical figure of the balloon. In addition, for the purpose of increasing the stability of the balloon at the critical moment of taking a photograph, the operator would steady it with a gentle draught upon the dependent cord containing the reophores, at the precise point of time when he makes the electrical contact with the shutter of the camera.

I here conclude the description of that one of my proposed additions to the art of photogrammetry which relates to precision of results obtainable from it for a continuous line of survey, and invite your attention for a moment to a method I suggest of using a similar captive balloon in a manner which would be useful in military operations. It need hardly be said that, whether captive or not, balloons have heretofore been used at great disadvantage in military operations, unless we except the use made of them for escape, with indirect reference to those operations during the recent siege of Paris. If the free aëronautic balloon passes over the enemy at such a distance as to make useful what can be observed from it, the glimpse is but transient, while its nearness and immense volume place it in great danger. If, on the other hand, a captive aëronautic balloon be used for military observation, it must ascend far from the enemy, to a height which measurably neutralizes the accuracy of the information sought.

The use for military purposes of a modification of the small spherical captive balloon which I have described would be conditioned solely upon the circumstance that the wind should be blowing towards the enemy's lines. The only change in it from the one described, that would be entailed by its new purpose, would be that it should be mounted with a simple network similar to that which is used on the kite, and to which the string for flying it, fastened similarly to the way in which it is fixed on the kite, should be attached. This string, with which the balloon would be flown like a tailless kite, would contain ordinary filigree reophores, through whose instrumentality the photographic shutter of the camera would be controlled by the operator. Lying several hundred yards away, or even a mile or two, if desirable, outside of an

enemy's lines of circumvallation, or line of battle, with the wind blowing in his direction, the balloon could be sent up with ballast proportioned to the general elevation intended for its soaring over his position. I have said "general elevation," because change of volume in the balloon, in accordance with the change of temperature, or increased weight on it, from an accession of moisture, preclude the possibility of calculating upon obtaining precise predetermined elevation for the balloon The weight of the string for the length to be paid out to the contemplated distance would of course enter into the amount of ballast needed to secure an approximately special elevation at a special distance. The distance to the enemy's position being known, and the vertical angle being taken to the balloon from its point of departure, when it is approximately delivered at its destination, the exact remaining length of string, with allowance for sagging, necessary to pay out so as to cause the balloon fairly to dominate the enemy's military works or line of battle, would at once be known by a simple computation, or could be taken from a table of angles and distances. This operation being completely performed at several points along the opposing military lines, a series of pictures, at varying distances from front to rear, and from right to left of the enemy's position could be secured by means of the electro-magnetic attachment to the shutters of the photographic cameras, each individual one of which could take a number of pictures without replenishment of plates. It is evident that such a use of the balloon and the photographic camera would have proved greatly advantageous to either side in such modern sieges as those of Sebastopol, Richmond, and Paris.

On the Skull of the Dinosaurian Lælaps incrassatus Cope.

By E. D. Cope.

(*Read before the American Philosophical Society, May 6, 1892.*)

The characters of the skull in the carnivorous Dinosauria are only partially known, so the present opportunity is improved to add to our knowledge a considerable number of points, if not to exhaust the subject. I have temporarily in my possession two incomplete crania of the *Lælaps incrassatus*, from the Laramie formation of the Red Deer river, in the Dominion of Canada, which have been submitted to me by the Geological

Survey of the country for determination and description. I express here my thanks to the honorable Director of the Survey, Dr. A. R. C. Selwyn, for the opportunity of examining these important specimens.

The first specimen consists of the skull, from the orbits to the muzzle inclusive, with the two dentary bones with teeth adhering to the inferior surface. The second specimen includes most of the parts absent from the first. The muzzle and orbital region are wanting, but the parietal and occipital regions are present, with the basis cranii and palate; parts of the quadrate bones and both mandibular rami nearly complete with teeth.

The bones of the skull are dense and light, and some of them are pneumatic. The sutures separating the premaxillary, maxillary and nasal bones are not distinguishable in the specimen, and both are considerably injured. There is a large subround preorbital foramen whose centre is a little nearer the superior plane of the skull than the alveolar border. It is separated from the orbit by a narrow isthmus. The frontal bone is very narrow between the orbits. The prefrontal forms a vertical convex crest on each side, as represented by Marsh to exist in the *Megalosaurus nasicornis*. The orbits are longitudinally widely parallelogrammic, and are of enormous size, equalling in long diameter the length of the muzzle in front of them. The postfrontal and postorbital elements appear to be fused, and form an L-shaped bone, whose horizontal limb is supraorbital, extending forwards over the orbit anterior to its middle, and terminating in an acute apex. The other limb is vertical and postorbital, extending to the jugal bone. A small piece on the inner side of the postfrontoörbital at its posterior angle on the superior face of the skull is of uncertain determination. The maxillary diminishes rapidly in depth below the orbit and terminates a little posterior to it. The jugal overlaps it above, and probably terminated at about the posterior third of the orbit, but the suture is not clear at this point. The frontal is supported below by two vertical elements posterior to the middle of the orbit. These closely resemble the corresponding pieces in Sphenodon, and are the postoptic* and epipterygoid respectively. They are preceded by a vertical compressed element which corresponds with the orbitosphenoid of Sphenodon, but it is not perforate, and the optic foramen is posterior to it. It is elongate anteroposteriorly, and its anterior extremity is concealed anterior to the orbit. The postoptic is strongly concave at its anterior margin, and the inferior part of this border is produced anteriorly. The epipterygoid, on the other hand, is openly concave posteriorly, its inferior portion being directed posteriorly and enclosing a large foramen with the postoptic. The external face of the maxillary bones is rugose with fine ridges, and rather numerous foramina. The jugal extends well posteriorly, and increases in depth, but its posterior extremity is broken from the specimen.

The mandibular rami are compressed, and the symphysis is oblique and ligamentous. The dentary bone is followed posteriorly above by a deep surangular, with rounded superior border, whose superior outline, though

* For the definition of this element, see Proc. Amer. Philos. Soc., 1882.

convex, rises but little above the level of the dentary. The dentary is produced below it. On the inner side is seen a large splenial foramen, from which extends anteriorly a narrow strip, the splenial. The other borders of the foramen are formed by a large laminiform bone, the opercular of Cuvier, which extends to the superior border of the ramus, cutting off the dentary posteriorly. It is apparently homologous with the inferior anterior part of the coronoid. For the remaining parts of the mandibular ramus see the description of the second specimen. The external face of the dentary is roughened and presents foramina which are most numerous anteriorly, where they are connected by shallow grooves, like the rims between the holes of small Mammalia. Opposite each tooth is one or two shallow vertical grooves.

The teeth have the usual Megalosaurian form and have long roots sunk in very deep alveoli There are eleven present in the maxillary bone, of which the terminal ones are rapidly reduced in dimensions. Fourteen teeth in the dentary bone which diminish in size at the posterior end of the series. The premaxillary teeth are lost, but none of those in the anterior part of the dentary bone have the incisor like character of those of the genus Amblypodon of Leidy The first tooth of the dentary is smaller than the second, and both have more convex external faces than the teeth which succeed them.

Measurements of Skull No. 1

	M.
Total length of specimen	600
Length (axial) to front border of preorbital foramen	140
Length to anterior border of orbit	215
Length to posterior border of orbit	585
Vertical diameter of orbit	120
Vertical diameter of skull at middle of orbit	180
Width of front at middle of orbit	80
Depth of dentary at posterior end of symphysis	90
Depth of dentary at end of dental series	127
Length of dental series	530
Length of dentary bone above	590
Length of sixth tooth above alveolus	57
Width of sixth tooth at alveolus	29

In the second skull the only part of the superior portion remaining is the brain case, and this is distorted by pressure which has forced it to the left side of the middle line. The postorbital region and the arches are gone. The occipital appears to be continuous and subhorizontal and is obtusely angulate medially above. The basioccipital is vertical as in the crocodiles proper, and the brain case is closed in front of the petrosal in much the same way, with thin ossifications. The foramen magnum is small, as is also the transversely oval occipital condyle, which looks directly posteriorly, and not downwards. On each side of the basioccipital are two large

foramina, one above the other, the inferior issuing in a deep groove or fossa. They are bounded externally by a broad vertical ala. Anterior to this ala are two other large foramina, one above the other, both issuing from fossæ. One or both of these is the trigeminal. The middle line of the brain case is keeled below, except near and at the anterior extremity, where it is flat and is perforated by a transverse foramen. This is possibly a pituitary foramen, which thus penetrates the palatal roof as in the Opisthocœlus Dinosauria as stated by Marsh.

The rami of the mandible are pressed obliquely against the inferior aspect of the skull, but are separated far enough to permit the palato pterygoid elements to be seen. These form a rather narrow, flattened rod on each side the middle line, which extend to the robust basipterygoid processes, which look downwards. Each pterygoid then turns abruptly outwards with its edge downwards towards the quadrate, but the specimen does not permit me to discover whether it reaches that element or not. It sends a robust process to the inner side of the basipterygoid, thus extensively embracing it. The anterior part of the palate is invisible.

The relations of the dentary and surangular bones are the same as in the specimen No. 1. This specimen shows that the angular and articular are distinct elements. The angular is an elongate element, which is extensively exposed anteriorly on the internal face of the ramus, and then passes to the external face, terminating in an acuminate lamina below the articular cotylus, but not reaching the angle. The articular is only developed anteriorly on the internal border of the ramus, where it extends well forwards, extensively overlapping the angular. The surangular extends posteriorly to the borders of the articular cotylus, and spreads out below the articular as though it would enter into the composition of the angle of the jaw, which it does not. It is perforated by a round foramen near its interior border, and its inferior face is separated from the external face by a prominent longitudinal down looking angle. The articular cotylus is transverse and is not bifossate. The quadrate contracts immediately above its condyle and is then broken off in the specimen, but it probably has a rather slender shaft.

There is a large foramen in the internal wall of the ramus which is bounded below by the articular.

A singular bone occurs in both skulls whose position I cannot determine. It is a slender, strongly curved cylindric cone, which rises from the posterior palatal region and turns upwards, outwards and then backwards and a little downwards, with a compressed acute apex. It is not articulated with any element at the apex, which lies near the jugal bone, and its basal connections are broken away in both skulls. It is possibly a part of the hyoid apparatus, but if so it is difficult to identify it with any known element. The hypohyal is more appropriate than any other, but I do not make any identification.

Measurements of Skull No. 2.

	mm.
Length of supraoccipital on middle line	170
Length of supraoccipital including occipital condyle	220
Width of basioccipital posteriorly	155
Width of foramen magnum	85
Diameters occipital condyle { vertical	40
Diameters occipital condyle { transverse	70
Width of distal end of quadrate	124
Total length of mandibular ramus	950
Length of dentary above	480
Length of fourth tooth from alveolus	55
Width of fourth tooth at alveolus	27

History.—I described this gigantic reptile in the Proceedings of the Philadelphia Academy for October, 1876, from teeth derived from the Laramie formation of Montana, and afterwards (*l. c.* December, 1876, p. 340), I described it more fully from a nearly entire dentary bone with teeth from the same region. This individual did not differ much in dimensions from those now described.

Our knowledge of the structure of the cranium of the carnivorous Dinosauria has been very slowly acquired. Buckland and Mantell originally knew only the mandibular rami, but Phillips much later obtained a maxillary bone. From these fragments he proposed a restoration on the basis of the skull of the Lacertilia, with but a single postorbital bar. In this kind of restoration Prof. Owen coincided on the occasion of his description of another maxillary bone in the Quarterly Journal, Geological Soc. of London, 1883, p. 334. In a figure of a restoration, he adopted the Lacertilian model instead of the Crocodilian, and he therefore inserted a triangular postorbital, and an elevated coronoid element. He also omitted the preorbital foramen. Dr. J. W. Hulke, at that time President of the Geological Society, expressed the opinion, on hearing Prof. Owen's paper, that Megalosaurus has two postorbital bars, an anticipation proven to be correct at a later date. In 1884, Prof. Marsh published a paper which contains a description of the skull of a species of carnivorous Dinosaur which he calls *Ceratosaurus nasicornis*. While this animal is probably a species distinct from the *Megalosaurus bucklandii*,* it has not yet been shown to belong to a different genus. In this paper the presence of a zygomatic arch like that of the Crocodilia is demonstrated for this sole order, and the preorbital foramen is also described. The general and more obvious characters of the cranium are given, but many of those which are necessary for an exact understanding of the position of the genus are not given; especially are the characters

* Amer. Jour. Sci. Arts, 1884, p. [illegible]. It has been shown that the character on which Prof. Marsh relied to distinguish the genus Ceratosaurus, and the family Ceratosauridæ, viz., the confluent metapodials, is pathological. The horned process on the nose is probably only a specific character.

of the mandibular ramus omitted. In the present paper these omissions are mostly supplied, but a number of important problems remain to be definitely settled. See Trans. Amer. Philos. Soc., 1892, Vol. xvii, p. 17, where one of these is stated. I pointed out in 1866, when the genus Lælaps was described, and later, in 1869 (Vol. xiv, Trans. Amer Philos. Soc.), that it differs from Megalosaurus in the much more acute and compressed claws. I add that the present species differs from the *M nasicornis* of Marsh in the much larger and more anteriorly placed orbits, and in the much smaller preorbital foramen.

Figures of these remains will be given in the final publication by the Geological Survey of Canada.

Addition to the Note on the Taxonomy of the Genus Emys C. Duméril.

By G. Baur.

(Read before the American Philosophical Society, May 6, 1892.)

In a discussion about the type of Emys with Dr. L. Hejneyer, this gentleman called my attention to the fact that, according to the Code of Nomenclature adopted by the American Ornithologists' Union, the type species could not be *T picta*, because this species is not named by Brogniart. According to his view not only the name *Emydes* ought to be used, as originally introduced by Brogniart in 1805 (Emys Dum., 1806), but also one of the species enumerated by Brogniart taken as the type. Brogniart mentions the following species with his genus *Emydes*: *E. ferox*, *E. rostrata*, *E. matamata*, *E. lutara*, *E. pensilvanica*, *E. clausa*. In 1806 Duméril referred the *E. matamata* to a new genus *Chelus*; in 1809 Geoffroy *E. ferox* and *E. rostrata* to *Trionyx*, *E. pensilvanica* belonging to *kinosternon* Spix; either *E. lutaria* or *clausa* has to be considered as type of Emydes. *E. lutaria* = *T orbicularis* L. being the common European form, ought to be taken as type of *Emydes*, and *E. clausa* = *T. carolina* L. ought to be considered as type of *Terrapene* Merrem., of which Cistuda Fleming is a synonym.

According to this we would have the following:

Emydes Brogniart, 1805,
  Type, *T. orbicularis* L.
Terrapene Merrem, 1820,
  Type, *T. carolina* L.
Chrysemys Gray, 1844,
  Type, *T. picta* (Herm. MSS.) Schn

Second Contribution to the Study of Folk-Lore in Philadelphia and Vicinity.

By Henry Phillips, Jr

(*Read before the American Philosophical Society, March 18, 1888.*)

SIGNS, PORTENTS AND OMENS.

Sunday is always the best or the worst day of the week.

If one sews anything upon a garment that is already on, it is a sure sign that some one will tell a falsehood about you.

It is unlucky to measure a child with a yardstick before it can walk.

It is unlucky to get out of bed left foot foremost.

It is unlucky to count one's money, as it will surely decrease.

One must never count what is eaten, as hunger and poverty will be the result later in life

A servant who comes on Saturday makes a short flitting.

If a man dies suddenly, leaving any appointments unfulfilled, his ghost will keep them

It is lucky to dream of excrement

Children who pick dandelions will urinate in their bed (*pis en lit*)

Bachelors' and old maids' children are always well brought up and well behaved.

Vessels named after women are unlucky as compared with those bearing the names of men

Vessels with a boasting or high-sounding title (such as *Monarch of the Seas*, *Dreadnaught*, etc) are unlucky.

It is unlucky to name a child after one of the same name, that has died.

When speaking of one's good fortune, one must always add · "I hope I speak in a lucky hour."

One must always wear something new on Easter day.

One must always wear something new on New Year's day.

A four-leaved clover is considered to bring good luck to its finder.

The tick of the "death watch" announces the speedy death of a member of the family

If you can't make a fire you'll get a bad husband.

Throw pepper after a disagreeable person to prevent his return.

Make a wish when a spotted horse is seen.

It is unlucky to twirl a chair upon one of its legs.

Crusts make whiskers grow.

An M marked in the palm of the hand indicates good fortune.

A woman who cuts bread into thin slices will make a poor stepmother.

Scissors and other steel articles should be hid during a thunder storm to prevent a thunderbolt.

Touching a corpse prevents bad dreams of it.

To dream of the dead is lucky.

Nose itching means sight of a stranger.

Heads of snakes never die until sundown.

Eels put on the land turn to snakes.

Never look over a person's shoulder into a mirror.

A fork dropped foretells a male visitor; a knife, a woman.

When the wind closes a shutter a stranger is announced.

If one drops a morsel in putting it to the mouth some one wants it.

If the first visitor to the house on a New Year is a man, good luck.

Go to watch meeting New Year's eve to obtain good luck throughout the year.

To rock an empty rocking chair will make angry its most constant occupant.

A Scotchman should never give a Bible.

Meeting eyebrows denote a contrary disposition; likewise hard to trust.

Very light eyes denote a shallow, variable disposition.

> Blue eye beauty, do its mother's duty;
> Brown eye ran away and told a lie.

To see the new moon over the right shoulder is lucky; over the left, unlucky.

> Two white feet look, well about him;
> Three white feet, do well without him;
> Four white feet and a white nose—
> Throw him to the crows.

It is unlucky, when walking with a person in the street, to permit any one to pass between and divide you.

It is unlucky to pass under a ladder.

If the *left* hand itches or burns it is a sign of paying out money; if the *right*, of receiving it.

Birth, Death and Marriage.

Two spoons accidentally placed in the tea saucer signifies a wedding.

Rhymes for brides-elect.

Married in white, you have chosen all right;
Married in gray, you will go far away.
Married in black, you will wish yourself back.

A white animal entering foretells death.

A child born face downwards never lives.

To drop a wedding ring from the finger indicates divorce.

If you marry in May
You will live a year and a day.

If you marry in Lent
You will live to repent.

Folk Medicine.

To cure fits in a cat one should bite off a small piece of its tail.

Warts will be produced if one handles a frog or a toad.

Warts can be removed by anointing with fasting spittle.

When one sneezes he must say: "To your everlasting beauty."

An eelskin worn about the ankle will keep off cramps.

Piercing the ears will improve the sight.

April snow applied to the face will improve the complexion.

It is ill luck to change a sick person's bedding.

The hair of a seventh son, in succession, prevents whooping-cough.

A drop of the sufferer's urine in the ear will cure earache.

Swinging a baby completely by the shirts prevents liver trouble.

A seventh months child can live, an eighth months cannot.

A copper penny dipped in vinegar and applied to a ring-worm cures it.

Tie your stocking around your neck on retiring to cure sore throat.

Sleeping towards the east produces headache.

Steal a potato, rub one-half on a wart and lose it to remove the wart.

SEASONS, WEATHER, ETC.

Evening red and morning gray
Will send the traveler on his way.

A dried snake hung up in a draught will produce a rain.

A star near the moon means a storm.

The first three days of a month declare its character.

On the second of July the Virgin Mary goes to visit her cousin Elizabeth; the weather on that day indicates the weather for the next six weeks, that being the length of the visit.

A green Christmas means a white Easter.

The departure and return of wild geese and crows announces winter and spring.

When the white side of the leaves is exposed by the wind a storm approaches.

When the dandelions are closed there will be rain.

In the spring there comes the blossom storm.

There is always a heavy storm to fill the streams before they freeze.

On the 2d of August comes the Lammas floods.

Ember days indicate the weather of the seasons.

The rain that makes large bubbles as it falls will be of long continuance.

If it clears up at night, the next night will be rainy.

Further Notes on Fuegian Languages.

By D. G. Brinton, M.D., LL.D.

(Read before the American Philosophical Society, May 6, 1892.)

Since the publication of my study on the Patagonian and Fuegian dialects in the *Proceedings* of the American Philosophical Society (No. 137, 1892), several important vocabularies have come to my notice.

An Early Fuegian Vocabulary.

One of these is the oldest known collected on the shores of Tierra del Fuego itself, that of Pigafetta having been derived from the Tsoneca, on the main land of Patagonia. That to which I refer was collected by the French navigator, Jouan de la Guilbaudière, during a sojourn of eleven months in the Straits of Magellan during the year 1695. It includes about three hundred words and short phrases, and no part of it has been published. The MS. copy in my possession I owe to the courtesy of M. Gabriel Marcel, the Librarian of the Geographical Section of the National Library of France. As, however, he intends giving it publicity in the Compte-rendu of the Congress of Americanists, it will be sufficient to illustrate its character by a limited selection of words. These show that the basis of the tongue is Alikuluf, and it differs scarcely more from the Alikuluf of the present generation than do between themselves the vocabularies of that tongue by Fitzroy and Dr. Hyades in the present century. A few words belonging to the Tsoneca and the Yahgan may be detected, probably introduced by trading natives. In the vocabulary the bracketed words preceded by an A. are from the Alikuluf of Fitzroy.

Fuegian (Alikuluf) Vocabulary of 1695.

dog, *chalgui* (A. *shillökl*).
ears, *cmuereal*.
egg, *lechelay* (A. *likh'la*).
eyes, *tiitche* (A. *tel-lile*).
fire, *ollay* (A. *tel-lil*).
forehead, *arraeel* (A. *lakeukal*).
head, *yacabad chapy* (A. *yuccaba*)
house, *haethe* (A. *hkt*).
man, *aechelesche* (A. *achkinish*).
moon, *yacabad charlo* (comp. Alik. *yuccaba*).
mouth, *asflet* (A. *uffeare*)
nose, *lentcha*.
oar, *oyogue* (A. *oy'ie*).
sea, *chapts* (A. *chakh'uel*)
skin, *olas* (A. *uo'ckiagh*).
smoke, *telgueche*.
sun, *arleog*.
teeth, *cheredge*.
tongue, *pedleaf*
water, *arret*.
woman, *aeche letay*.
wrist, *yacabed charcel*.

A few words show Tsoneca affinities, as:

	Fuegian.	Tsoneca.
water,	*arret*,	*karra*.
teeth,	*cheredge*,	*curr*, *orr*.

Language of the Onas (Aonas).

Up to the present time no linguistic material from Eastern Tierra del Fuego has been available; and consequently the ethnic affinities of the tribes that live there have been but guessed at.

Collectively these tribes are known to the Tehuel-het of Southern Patagonia as *Yakana-cunny*, "foot Indians," as having no horses and but few boats, their journeys are made on foot; while the Yahgans refer to their territory as *Onàçin*, the "land of men," whence the appellation "Onas."

The Onas are taller and stronger than the aquatic Yahgans and Alikulufs, who inhabit the Fuegian archipelago, and are described as in face and figure closely resembling the typical North American Indian (Popper). For this reason, apparently, it has been assumed by recent writers that they are a branch of the tall and large-limbed Patagonians north of the Straits of Magellan.

This is the opinion advanced by Drs. Hyades and Deniker in their Report in Vol. vii of the *Mission Scientifique du Cap Horn* (Paris, 1891). They acknowledge, however, that they had been unable to obtain any linguistic material on which to institute comparisons.

Such material has fortunately been secured lately by Dr. Polidoro A. Segers, and he has printed a short vocabulary in the *Boletin del Instituto Geografico Argentino* (Buenos Ayres, 1891), for which he claims exactness. It is printed apparently in the phonetics of the Spanish alphabet, which, one would think, would be far from adequate to express the sounds of the language, if we may credit the statement of the English missionary, Mr. Brydges, that they are peculiarly harsh and guttural, "resembling the sounds made by a person who is gargling with difficulty!"

The location of the Onas is described in the *Boletin* above referred to, both by Dr. Julio Popper and Dr. Segers. The tribe is divided into a number of bands, in constant feud with each other, and all without fixed habitations. To the north, between the Bay of St. Sebastian and Cape Sunday, are the Parrikens, the Shellis and the Uenenke; to the south, from about Cape Penas to the Straits of Lemaire, roam the Kau-ketshe, the Koshpijom and the Loualks. These differ among themselves in dialect, but not to such an extent as to be mutually unintelligible. The precise band

from which the following vocabulary was obtained by Dr. Segers is not clearly stated, but apparently from the Parrikens.

A slight examination of this list of words is sufficient to disprove the statement made by the writers of the *Mission Scientifique du Cap Horn* that the language of the Onas is a dialect of the Southern Patagonian or Tehuelhet.

Its affinities are much closer with the Yahgan, although perhaps not near enough to allow us to speak of it as a dialect of that stock.

In the eighty-four words in Segers' vocabulary, I do not find the Yahgan correspondents for fourteen. Of the seventy remaining, twenty-three, or about one-third, are identical with the Yahgan or allied to it. Allowing for the very great difficulties in the way of a comparison of material such as I have at command, it is probable that with vocabularies carefully constructed on the same phonetic bases, and with correct identification of objects, a closer relationship between the two stocks would be demonstrated.

In the vocabulary I have placed the Yahgan equivalent in brackets, preceded by the letter Y. The Yahgan vocabularies I have employed are those of Fitzroy, Bove and the more detailed one in the *Mission Scientifique du Cap Horn*. The bracketed words preceded by Ts. are from the Tsoneca language.

VOCABULARY OF THE ONAS LANGUAGE, TIERRA DEL FUEGO.

accouch, to, *tehá-ia*.
angry, *ádlá*.
arrow, *tá-al*.
arrowhead, *tash* (Y. *tahouah*).
ashes, *iuen* (Y. *ouan*).
awaken, to, *pash*.
back hair, *tani*.
basket, *tued* (Y. *taouala*).
beard, *anu-etahal*.
belly, *kashtem* (Y. *kashtamia*, liver).
black, *mái*.
bow, a, *wal-en* (Y. *walana*).
bowstring, *tanal-sal* (Y. *ahali-sal*).
brain, *hoiar*.
brother, *tá-tegte*.
call, to, *oul-aha*.
crab, *kámal*.
defecate, to, *sha-dahteri*.
dirty, *keahá-a*.
drink, to, *kolata* (Y. *hayaahamy*, to drink from a cup).
eat, to, *tahem-ka* (Y. *a-tama*).
enough, *eána*.
eyebrows, *oshel etahel* (see *eye* and *hair*).
fall, to, *ua-da*.
fat (grueso), *allá* (Y. *oulou*).
fire, *aá-al* (Y. *iqouali*, "lepiarbe à feu").
flame, *talel*.
fog, *ótem*.
for me, *tab ka*.
for you, *mab-ka*.
friend, male, *toah-talk*.
female, *toah-ka*.
good, *ahalke*.
good-by! *sani-malk*.
good-night! *oshen*.

go out! *shetn.*
hair (in general), *atshel* (Y. *atpela,* all short hair).
heart, *ad-se* (Y. *us-shin*).
heaven, *mate.*
hot, *pouwshkh.*
I, me, *iay* (Ts. *ia*).
ice, *tal.*
knife, a, *al* (Y. *ovilla*).
labial commissure, *taha-lake.*
large, *otsh* (Ts. *ahotsh*).
lie, a, *lthe.*
mamma, *tam.*
moon, *asien.*
morning, *vdnke.*
mother, *tedn.*
mouth, *conhen.*
nail, of finger, *hale* (Y. *galouf*)
neck, *hisel* (Y. *heruhrel,* larynx).
open, to, *diepan.*
play, to, *tal-id.*
rain, *ahen-mush.*
ready, *takl-libe.*
red, *pelatel.*
run, to, *ua-akha.*
sad, *ashen.*
saliva, *compl.*
sea, *paisho* (Y. *papaks,* or *hayvea*).
shut, to, *ojome.*
sick, *pteal.*
sister, *il-she.*
skull, *'alstein.*
sleep, to, *ashtl* (Y. *dehd*).
slowly, *la-id.*
small, *tahool.*
smell, to, *ks-shenuen.*
smoke, *tel.*
snow, *tra.*
soon, *te-eh.*
sun, *anighe* (Ts. *gengenke*)
thanks! *pi-iruhen-iamakl.*
thick, *bitstabl.*
thou, you, *may* (Ts. *ma*)
to-day, *md.*
urinate, to, *akkrtien* (Y. *euaheur*).
vagina, *pe-al.*
water, *otsn.*
weak, *tahe-ual.*
winter, *shouke.*
yawn, to, *taha-teal.*

It will be noticed that the personal pronouns are derived from the Tsoneca, while the words for bow, bowstring and arrowhead are Yahgan. This indicates that this weapon originated with them from the latter element of their population.

The result of this comparison is to place the Onas nearer to the Yahgans than to the natives of the mainland. They are evidently a mixed people, not an independent stock, physically allied to the Patagonians, linguistically belonging in the main to the Yahgan group.

Yahgan Vocabularies.

A few words may be added on the accessible material for the study of the Yahgan language. Its grammar has been made the theme of an able analysis by Mr. Lucien Adam, and a vocabulary has been studied from the translation of the New Testament by Mr. Julius Platzmann. Both these rest on the labors of the English missionary, the Rev. Mr. Brydges. The same is apparently the

case with the quite extensive and satisfactory list of words presented in the *Mission Scientifique du Cap Horn.*

The authors of the latter point out the important fact that of the 200 Yahgan (Tekenika) words collected by Fitzroy in 1830–32, 120 are wholly erroneous, most of them belonging to the Alikuluf tongue.

In the report of Commander Giacomo Bove (*Patagonia, Terra del Fuoco, Mari Australi*, Parte I, Genova, 1883), there is a Yahgan vocabulary of 164 words. It also was obtained through the instrumentality of Mr. Brydges, and is satisfactorily accurate.

The Hongote Vocabularies.

In my previous communication on Fuegian dialects, I quoted two short vocabularies from a MS. in the British Museum said to be from the "Hongote" language, and which, from the paper forming a part of a record relating to Patagonia, I took to be dialects of that region.

This is the first opportunity I have to correct this error. Dr. Franz Boas has pointed out to me that one vocabulary is clearly Salish, and must have been collected in Fuca strait on the northwest coast. He thinks it may be the Songish dialect, a name which remotely resembles "Hongote." How it came to form a part of a mass of documents relating with this exception wholly to South America, I cannot explain. The other he considers Tlinkit. Under such circumstances and in view of the hundreds of languages on the continent, it is easy to see how such a mistake could occur. I am glad to be able to correct it promptly.

Stated Meeting, April 1, 1898.

Present, 17 members.

President, Mr. Fraley, in the Chair.

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (185); Musée Colonial, Haarlem, Holland (186); Dr. Paul Albrecht, Hamburg, Germany (184); Prof. Guido Cora, Turin, Italy (185); Victoria Insti-

tute, London, England (186); Pennsylvania State College Agricultural Experiment Station (186).

The following societies were placed on the Proceedings exchange list: Naturwissenschaftlicher Verein für Schleswig-Holstein, Kiel, Prussia; American Institute of Electrical Engineers, New York, N. Y.; Sociedad Cientifica Argentina, Buenos Ayres; Agricultural Experiment Stations at Blacksburg, Va., Burlington, Vt., College Station, Tex., Geneva, N. Y., Agricultural College, Mich., Baton Rouge, La., Newark, Del., and St. Anthony Park, Minn.

Accessions to the Library were reported from the Government Observatory, Madras, India; Osservatorio Marittimo, Trieste, Austria; Biblioteca N. C. V. E., Rome, Italy; Essex Institute, Salem, Mass.; Connecticut Agricultural Experiment Station, New Haven; American Museum of Natural History, New York; Agricultural Experiment Station, Newark, Del.; Dr. Charles K. Mills, Philadelphia; Department of State, Bureau of Ethnology, Superintendent of Documents, U. S. Civil Service Commission, U. S. Lighthouse Board, Washington, D. C.; Agricultural Experiment Stations at Bryan, Tex., St. Anthony Park, Minn., Topeka, Kans.; Sociedad Cientifica Argentina, Buenos Ayres, S. A.; Deutscher Wissenschaften Verein, Santiago, Chili.

Dr. Ruschenberger read an obituary notice of the late Dr. Joseph Leidy.

The decease of the following members was announced: Dr. D. Hayes Agnew, Philadelphia, March 22, 1892, æt. 74; Ario Pardee, Hazleton, March 26, 1892, æt. 82.

The President subsequently appointed Dr. William Pepper to prepare the usual obituary notice of Dr. Agnew and W. A. Ingham that of Mr. Pardee.

Prof. Cope presented a communication upon "Some Little Known Palæozoic Vertebrates."

On motion, Dr. Cope's paper on "The Osteology of the Lacertilia," offered at the last meeting for the Transactions, was authorized to be printed in the Proceedings.

Pending nomination No. 1238 and new nomination No. 1241 were read.

The Curators reported progress in the matters committed to them by resolution of March 18.

The following resolutions offered by Mr. Bache at the last meeting then came up:

Resolved That, if the funds of the Society permit, this room be now put in charge of a Committee, for the purpose of receiving such treatment as to its walls, ceiling and columns as accord with the character of the Society, and that the Society instruct the Curators to exclude from the cases everything but such printed matter as is desirable for ready reference, and from the floor any articles which are not conducive to the primary purpose in this room of convenience of the members of the Society.

The first resolution, referring to the decoration of the room, was withdrawn, and, owing to the lateness of the hour, the further consideration of the second resolution was postponed.

On motion of Dr. Hays, the Librarian was requested to remove from their present place of storage the books, MSS., etc., belonging to the Society.

The Committee appointed February 5, 1892, on the Columbian Celebration, was increased to five members, Dr. Ryder and Mr. Horner being added.

And the Society was adjourned by the President.

April 15 falling on Good Friday, no meeting of the Society was held.

Stated Meeting, May 6, 1892.

Present, 8 members.

Mr. Richard Vaux in the Chair.

Letters were received as follows:

A circular inviting subscriptions for the erection of a monument to Prof. G. A. Hirn, in Colmar, Alsace.

Program of the First Anniversary of the Tacoma Academy of Sciences, April 28, 1892.

A circular letter from the Musée D'Oaxaca, Mexico, announcing the death of M. le Général Mariano Jiménez, Gouvérneur constitutional de l'Etat de Michoacan d'Ocampo, February 28, 1892.

A letter from Mrs. Caroline Lewis, Secretary of the Loan Exhibition in connection with the University Lecture Association, Philadelphia, returning thanks to the Society for the loan of the busts of La Fayette and Franklin.

The following donations to the cabinet were received·

A photograph for the Society's album from Charles E. Sajous, M.D., Philadelphia.

A framed engraving of David Rittenhouse, LL.D., by E. Savage, Philadelphia, 1796, after the portrait by C. W. Peale, from Miss Emily Phillips.

Letters of envoy were received from the K. K. Astronomisch-Meteorologisches Observatorium, Triest, Austria; Bath and West and Southern Counties Society, Bath, England; Department of Science and Art, London, England; Department of the Interior, Washington, D. C.; Museo Nacional de Buenos Ayres.

Letters of acknowledgment of diploma were received from Rt. Rev. William Stubbs, Oxford, England: Prof. E. Mascart, Paris, France; Marquis Antonio De Gregorio, Palermo, Italy; Sir George G. Stokes, Cambridge, England; Mr. Charles Godfrey Leland, London, England; Mr. John Fulton, Johnstown, Pa.; Prof. Henry Willis, Philadelphia; Dr. W. J. Hoffman, Washington, D. C.

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (136); Colonial Museum, Haarlem, Holland (136); Dr. Aristides Brezina, Vienna (136); Prof. Peter P. v. Tunner, Leoben, Austria (136), Gesellschaft für Erdkunde, Prof. F. Reuleaux, Berlin (136); Royal Saxon Society of Sciences (128, 135); Dr. Julius Platzmann, Leipzig (136); Union Geographique du Nord de la France, Douai, France (96–130 and Catalog, Parts i–iv); École Nationale

D'Agriculture, Montpellier, France (186); Editors of *Cosmos*, Profs. Abel Hovelacque, Emil Levasseur, Marquis de Nadaillac (186); Prof. E. Mascart, Paris (181–186); Philosophical Society, University Library, Cambridge, England (186); Yorkshire Geological and Polytechnic Society, Halifax, England (186); Zoölogical Society (Trans. xvi, 8 and 180–186), Royal Society, R. Astronomical Society, Linnean Society, Royal Institution, Geological Society, R. Meteorological Society, Prof. William Crookes, Dr. William H. Flower, Sir Rawson W. Rawson, London, England (186); Mr. Samuel Timmins, Arley, Coventry, England (186); Natural History Society of Northumberland, etc., Newcastle-on Tyne (186); Geographical Society, Manchester, England (96–180 and Catalog), Royal Society, Royal Observatory, Edinburgh (186); Mr. Hamilton A. Hill, Boston, Mass. (184); Harvard College, Cambridge, Mass. (Catalog, Part iv), Mrs. Helen Abbott Michael, Philadelphia (185, 186); Agricultural Experiment Station, Newark, Del. (185, 186); U. S. Naval Institute, Annapolis, Md. (186); U. S. Geological Survey, Washington, D. C. (186); Rev. Henry S. Osborne, Oxford, O. (186); State Agricultural College, Manhattan, Kans. (186); State University, Iowa City, Ia. (184, 186); California Academy of Sciences, San Francisco (186); Texas Agricultural Experiment Station, College Station (185, 186 and pams.); Musée de La Plata, Argentine Republic, S. A. (186); Mr. Everard F. im Thurn, Georgetown, British Guiana, S. A. (186).

Letters of acknowledgment (187) were received from the Geological Survey, Ottawa, Canada; Hon. J. M. Le Moine, Quebec, Sir Daniel Wilson, Canadian Institute, Toronto; Bowdoin College, Brunswick, Me.; Historical Society, Society of Natural History, Portland, Me.; Prof. C. H. Hitchcock, Hanover, N. H.; Vermont Historical Society, Montpelier; Amherst College Library, Amherst, Mass.; Museum of Comparative Zoölogy, Prof. Alexander Agassiz, Mr. Robert N. Toppan, Cambridge, Mass.; Institute of Technology, Boston Society of Natural History, Mass. Historical Society, Athenæum, Messrs. Thomas M. Drown, Hamilton Hill, Robert C.

Winthrop, Boston; Mr. James B. Francis, Lowell, Mass.; Free Public Library, New Bedford, Mass.; Dr. Pliny Earle, Northampton, Mass.; Essex Institute, Salem; Prof. Elihu Thomson, Swampscott, Mass.; American Antiquarian Society, Worcester, Mass.; Prof. George F. Dunning, Farmington, Conn.; Conn. Historical Society, Hartford; N. H. Colony Historical Society; Prof. James Hall, Albany; Prof. W. Le Conte Stevens, Brooklyn; Buffalo Library; Prof. Edward North, Clinton, N. Y.; Profs. T. F. Crane, J. M. Hart, B. G. Wilder, Ithaca, N. Y.; University of the City of New York, Historical Society, Amer. Institute of Electrical Engineers, N. Y. Hospital, Amer. Museum of Natural History, Profs. J. A. Allen, Daniel Draper, R. W. Raymond, J. J. Stevenson, W. P. Trowbridge, New York; Vassar Brothers' Institute, Poughkeepsie; Oneida Historical Society, Utica; Prof. Henry M. Baird, Yonkers; U. S. Military Academy, West Point; Dr. Charles B. Dudley, Altoona, Pa.; Dr. Robert H. Alison, Ardmore; Prof. Robert W. Rogers, Carlisle; Hon. Eckley B. Coxe, Drifton; Profs. J. W. Moore, Thomas C. Porter, Traill Green, Easton; Mr. Andrew S. McCreath, Harrisburg; Mr. John Fulton, Johnstown; Linnean Society, Lancaster; College of Physicians, Engineers' Club, Library Company of Philadelphia, Numismatic and Antiquarian Society, Academy of Natural Sciences, Wagner Free Institute, Messrs. Cadwalader Biddle, Arthur E. Brown, S. Castner, Jr., Robert Patterson Field, William W. Jefferis, G. deB. Keim, Benjamin Smith Lyman, James T. Mitchell, Robert Patterson, Franklin Platt, Theodore D. Rand, J. G. Rosengarten, Coleman Sellers, William P. Tatham, D. K. Tuttle, Louis Vossion, Ellis Yarnall, Profs. John Ashhurst, Jr., E. D. Cope, F. A. Genth, Jr., H. D. Gregory, Benjamin Sharp, Albert H. Smyth, H. W. Spangler, Admiral Macauley, Drs. D. G. Brinton, John H. Brinton, George Friebis, Charles A. Oliver, C. N. Pierce, W. S. W. Ruschenberger, William H. Wahl, Philadelphia; Prof. John F. Carll, Pleasantville; Rev. G. W. Anderson, Rosemont; Dr. John Curwen, Warren, Pa.; Philosophical Society, Messrs. Philip P. Sharples, Washington Townsend, West Chester;

Agricultural Experiment Station, Newark, Del.; Mr. William M. Canby, Wilmington, Del.; Mr. Isaac C. Martindale, Camden; Free Public Library, Jersey City; Profs. Charles W. Shields, C. A. Young, Princeton; Va. Historical Society, Richmond; Mr. Jed. Hotchkiss, Staunton, Va.; University of Virginia, Leander McCormick Observatory, Dr. J. W. Mallet, University of Virginia; West Va. University, Prof. J. C. White, Morgantown, W. Va.; Prof. Lyon G. Tyler, Williamsburg, Va.; U. S Naval Institute, Annapolis, Md.; Maryland Institute, Peabody Institute, Baltimore; Agricultural Experiment Station, College Park, Md.; Agricultural Experiment Station, Raleigh, N. C.; Georgia Historical Society, Savannah; University of Alabama, Tuscaloosa; Prof. E. W. Claypole, Akron, O.; University of Cincinnati, Cincinnati Observatory; Journal of Comparative Neurology, Granville, O.; Rev. Henry S. Osborn, Oxford, O.; Dr. Robert Peter, Lexington, Ky.; Athenæum, Columbia, Tenn.; Prof. J. L. Campbell, Crawfordsville, Ind.; Purdue Experiment Station, LaFayette, Ind.; Col. William Ludlow, Detroit, Mich.; Academy of Natural Sciences, Davenport, Ia.; Iowa State University, Iowa City; Agricultural Experiment Station, State Historical Society of Wisconsin, Madison, Wis.; University of California, Berkeley; Prof. J. C. Branner, Menlo Park, Cal.; Agricultural Experiment Station, Lincoln, Neb.; Agricultural Experiment Station, Manhattan, Kans.; Kansas Academy of Science, Topeka.

Accessions to the Library were reported from the Royal Society of Victoria, Melbourne; Bataviaasche Genootschap van Kunsten en Wetenschappen; Osservatorio Marittimo, Trieste; K. K. Geographische Gesellschaft, Vienna, Austria; Physikalische Gesellschaft, K. P. Akademie der Wissenschaften, Berlin; Deutsche Seewarte, Hamburg; Verein für Erdkunde, Metz; Koloniaal Museum, Haarlem, Holland; Société des Sciences, Liège; Institut R. Grandducal, Luxembourg; Naturwissenschaftliche Gesellschaft, St. Gall; Naturforschende Gesellschaft, Zurich; Società Africana D'Italia, Naples; R. Osservatorio Astronomico, Turin; Société Lan-

guedocienne de Geographie, Montpellier, France; M. Désiré Pector, Paris; Bath and West of England Society, and Southern Counties Association, Bath; Yorkshire Geological and Polytechnic Society, Halifax, England; Royal Meteorological Society, British Association for Advancement of Science, Solar Physics Committee, London; Natural History and Philosophical Society, Belfast; Philosophical Society, Glasgow; Mr. Horatio Hale, Clinton, Ontario, Canada; Marine Biological Laboratory, Boston; Public Library, Salem; American Antiquarian Society, Worcester; Yale University, New Haven; Historical Society, Buffalo; Columbia College, Historical Society, Prof. J. A. Allen, Hon. Seth Low, New York; Penna. State College, Harrisburg; University of Pennsylvania, Mercantile Library, Prof. Albert H. Smyth, Drs. D. G. Brinton, Charles K. Mills, C. A. Oliver, W. T. Parker, Messrs. W. S. Baker, Henry Phillips, Jr., Philadelphia; U. S. Naval Institute, Annapolis; Johns Hopkins University, Baltimore; Department of the Interior, U. S. Coast and Geodetic Survey, Bureau of Ethnology, Dr. A. C. Peale, Washington, D. C.; Elisha Mitchell Scientific Society, Raleigh, N. C.; General Society of the Sons of Revolution, Savannah, Ga.; Society of Natural History, Cincinnati; Academy of Science, St. Louis, Mo.; University of California, Berkeley; Academy of Sciences, Mercantile Library Association, San Francisco; State Board of Agriculture, Lansing, Mich.; State Historical Society, Fremont, Neb; University of Nebraska; Observatorio Meteorologico-Magnetico Central, Mexico; Museo Nacional, Buenos Aires, S. A.; Agricultural Experiment Stations: Hanover, N. H., Amherst, Mass., Uniontown, Ala., Lexington, Ky., Knoxville, Tenn., Agricultural College, Mich., Madison, Wis., Topeka, Kans., Las Cruces, N. M., Brookings, S. Dak., Tucson, Ariz.

Mr. Bache read a paper on "Civil and Military Photogrammetry."

A paper by Prof. Daniel G. Brinton, entitled "Further Notes on Fuegian Languages," was presented.

Prof. Cope presented a paper "On the Skull of the Dinosaurian Lælaps Incrassatus."

A paper by Prof. G. Baur (Worcester, Mass.), entitled "Additional Note on the Taxonomy of the Genus Emys," was presented.

Pending nominations Nos. 1238 and 1241 were read.

The following report of the Curators was presented and its consideration was postponed.

In response to the resolution of the Society, in which the Curators are instructed to state the nature of the Society's collections at present housed outside of this Hall, together with the space they would occupy if properly displayed, we have to report as follows:

1. Coins at Memorial Hall, deposited about 1878. The collection is small, probably not five hundred pieces. These could be easily displayed in a case such as that now at the southwest corner of this meeting room. There is, however, a fine oak cabinet belonging to the Society, at present in charge of the Numismatic Society, which is of ample capacity, and could be utilized if necessary.

2. The Poinsett and Keating collections of Mexican and other objects. These comprise about twenty-eight hundred objects of archæological interest. The combined collection is perhaps unique in some respects, and was deposited at the Academy of Natural Sciences in 1878. We believe that this collection could be displayed fairly well in such space as that now occupied by the cases on the north wall of this meeting room, west of the door.

3. Various paleontological specimens deposited at the Academy of Natural Sciences in 1864.

4. The French metre, loaned to the Coast Survey some forty or fifty years ago, and in use by them as a standard.

5. A stone cannon ball fired at Queen Mary and Douglass as they were escaping from Loch Leven Castle. Loaned to the Historical Society March 31, 1874.

PATTERSON DU BOIS,
R. MEADE BACHE,
J. CHESTON MORRIS,

And the Society was adjourned by the presiding member.

Stated Meeting, May 20, 1893.

Present, 24 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

A letter from the Committee of Philadelphia Councils on the Columbian Celebration at Chicago, in 1893, requesting the loan of certain articles owned by the Society was read and the consideration of the subject was postponed.

Letters of envoy were received from the Geological Survey of India, Calcutta; K. P. Meteorologische Institut, Berlin; K. Leopoldinisch-Carolinische Akademie, Halle a. S.; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Société de Physique et d'Histoire Naturelle, Geneva, Switzerland; Royal Statistical Society, Zoological Society, London, Eng.; Geographical Society, Manchester, Eng.; U. S. Coast and Geodetic Survey Office, Washington, D. C.

Letters of acknowledgment were received from Captain Richard C. Temple, Mandalay, Birmah (135); Comité Geologique de la Russie, St. Petersburg (136); Société Hongroise de Géographie, Budapest (96–130, and Catalog, Parts i-iv); Prof. A. E. Nordenskiöld, Stockholm, Sweden (136); Prof. Senat G. Capellini, Bologna, Italy (132, 133, 134, 135); Naturforschende Gesellschaft des Osterlandes, Altenburg, Germany (136); K. Geodätisches Institut, Berlin (96–130, 136, and Catalog, Parts i-iv); Redaction der Naturwissenschaftlichen Wochenschrift, Berlin (136); Naturwissenschaftlicher Verein, Bremen (136); Verein für Erdkunde, Dresden (136); Wetterauische Gesellschaft für die Gesammte Naturkunde, Hanau (135); Bibliothek der Astronomischen Gesellschaft, K. Sternwarte, Prof. J. Victor Carus (135), Dr. Caspar René Gregory (136), Leipzig; Académie Royale des Sciences,

Lisbon, Portugal (181–184), Entomological Society, London (186); Prof. James Geikie, Edinburgh (186); Natural History Society, Sir J. W. Dawson, Montreal (187); U. S. Institute of Science, Halifax, N. S. (187), State Library of Massachusetts, Boston (187); R. I. Historical Society, Providence, Franklin Society, Providence, R. I (187), Yale University, New Haven (187), Academy of Sciences (187); Editor of the *Popular Science Monthly*, New York (119, 181, 188); N. J. Historical Society, Newark (187), Prof. L. B. Hall, Haverford, Pa. (187); Mrs. Helen Abbott Michael, Messrs. Thomas M. Cleeman, Louis A Scott, Philadelphia (187); Patent Office, Anthropological Society, U. S. Coast and Geodetic Survey, Departments of the Interior and Agriculture, Naval Observatory, U. S. Geological Survey, Mr. William B. Taylor, Profs. S. F. Emmons, Herman Haupt, C. V. Riley, Charles A. Schott, Rt. Rev John J. Keane, Dr. W. J. Hoffman, Washington, D. C. (187), Agricultural Experiment Station, Baton Rouge, La. (187), Lick Observatory, Mount Hamilton, Cal. (187); Prof. Daniel Kirkwood, Riverside, Cal (187); Prof. George Davidson, San Francisco, Cal. (187), Sociedad Cientifica "Antonio Alzate," Mexico (187), Museo Michoacano, Morelia, Mexico (187); Colorado Scientific Society, Denver (187).

Accessions to the Library were reported from the Geological Survey of India, Calcutta, K. P. Meteorologische Institut, Berlin; K. Leopoldino-Carolinische Deutsche Akademie der Naturforscher, Halle a. S; Würtembergische Kommission für Landesgeschichte, Stuttgart, M. J H. Schwarz, Kladno, Bohemia, Mittelschweizerische Geographische-Commercielle Gesellschaft, Aarau; Société de Physique et d'Histoire Naturelle, Geneva; R. Académie des Sciences, Turin, Italy; Sociedade de Geographia, Lisbon, Royal Institution, London; Royal Irish Academy, Dublin; Historical and Scientific Society of Manitoba, Winnipeg; M. Edward Collom, Rockwood, Ont., University of Vermont, Agricultural Experiment Station, Burlington, Vt.; R. I. Historical Society, Providence, R. I.; Yale University, New Haven; Profs. J. A.

Allen, Mr. Edward L. Youmans, New York, N. Y.; Mr William J. Potts, Camden, N. J.; Messrs William S. Baker, Henry Phillips, Jr., Philadelphia; Interstate Commerce Commission, Washington, D. C.; Academy of Science, Mercantile Library Association, St. Louis; Colorado Scientific Society, Denver.

The following deaths were reported:

Dr. C. A. Dohrn (Stettin), May 5, 1892, æt. 87.
August William Hoffman (Berlin), May 6, 1892, æt —

The minutes of the Board of Officers and Council were submitted and the following preambles and resolutions therefrom were read and considered.

Mr Phillips moved

"*Whereas*, This Society did in the year 1843 celebrate the Centennial Anniversary of its foundation by a series of addresses, meetings, receptions, exercises, etc, upon the 25th, 26th, 27th, 28th, 29th, and 30th days of May, the results of which were published in a special volume of over two hundred pages, and,

"*Whereas*, We are approaching the Sesqui Centennial Anniversary of the same auspicious event; therefore, be it

"*Resolved*, That the Society will celebrate the same in a worthy and becoming manner

"*Resolved*, That the President be authorized to appoint a Committee of five members to make all necessary arrangements for the same and with full power to act, and that the President be *ex officio* a member of said Committee"

The preamble and resolutions being considered by the Society were unanimously agreed to.

The President subsequently appointed as said Committee Messrs. Henry Phillips, Jr., Chairman, J. Sergeant Price, Daniel G. Brinton, Richard Vaux and William V. Keating

Pending nominations Nos. 1238 and 1241 were read, spoken to and balloted for.

New nomination No. 1242 was read.

The following report and resolutions were presented by Mr. Williams:

Your Committee, appointed under a resolution passed as follows:

"*Resolved*, That a Committee of three be appointed by the President to consider and report to the Society upon the advisability of an annual grant for the purpose of aiding the publication or assuming the entire cost of publishing transcripts of the Babylonian tablets on deposit in the Museum of the University of Pennsylvania"

has the honor to report that the collection of clay tablets inscribed in cuneiform from the Temple of Bel at Niffer, now deposited in the Museum of the University of Pennsylvania, numbers nearly seven thousand specimens and constitutes the most important collection of this character in the country, and one of the most important in the world, ranking third among such collections. The consecutive character of these temple archives, the long period they cover, and their complete and varied character, render their publication of the utmost importance to the world of learning, while the circumstance that similar records are frequently repeated render it possible to give a fair summary by publishing portions arranged in selected series, by dynasties and with reference to the subjects treated. It is therefore practicable to publish successive volumes of these texts, each of which shall be complete in itself, and which do not necessarily involve the publication of others in the series, though the value of all will be greatly increased by the publication of the whole

The first cuneiform text was published by the East India Company in 1804, the inscription in its collection being engraved. Publications of texts have since been made by the British Museum, by the French and German Governments, by various learned societies and by private publishers, aided by subscriptions and grants. The experience of nearly a century has conclusively established that the best results in development of research and in aid of study are secured by publishing a transcription of cuneiform texts, without translations. The texts once published, the material for study now inaccessible in the Museum is opened to all scholars.

The transcription of a series of these tablets is now nearly completed by a member of this Society, Dr H V. Hilprecht. Its publication will fill about seventy plates of a size similar to the quarto page of the Transactions of the Society, and cost, if reproduced by any photo lithographic process, about $500. Other similar volumes will be produced in the future, and while the publication of the first of these issues will not pledge the Society to publish its successors, this fact ought to receive due consideration. In any case, only a small portion of the 7000 tablets will be published, and years will pass before even eight or ten volumes of like size will be presented for publication.

The publication of the first volume presents therefore a single issue on a subject of the utmost importance to sound scholarship, a credit to American learning, and a work which will not see the light by private enterprise. Your Committee feels that this is a case which appeals directly to this Society, coincides with its past policy, and is certain to add to the value and importance of its Transactions On inquiry it appears that a sum nearly sufficient for this expenditure can be secured out of this year's appropriations, and the remainder can be provided for out of next year's income. The Transactions offer a medium in all respects suitable, its page being of the proper size and the method of publication enabling the volume to be issued separately and should the series be continued, they can be numbered consecutively Your Committee therefore recommend the passage of the following resolutions

"*Resolved*, That it is the sense of the Society that the publication of the cuneiform texts transcribed from the tablets in the Museum of the University of Pennsylvania be begun by the publication of a single volume, without committing the Society to the publication of successive volumes in the series.

"*Resolved*, That this volume be submitted for approval to the Publication Committee of the Society and be issued by the Committee as a part of the Transactions, due reference being had to future publications in the series, if the same shall be determined upon in due course under the rules and order of the Society "

TALCOTT WILLIAMS,
J SERGEANT PRICE,
PATTERSON DU BOIS,
Committee

After a discussion the resolutions were adopted, and also a third resolution offered as an amendment by Mr. Martindale

Resolved, That the sum of $500 in addition to the amount already appropriated for the publications of the Society be granted in order to further the publication of the texts referred to in the foregoing report.

The deferred business of the Society was taken up and considered, and the following resolution offered by Mr Bache, was considered :

Resolved, That the Society instruct the Curators to exclude from the cases in the meeting room of the Society everything but such printed matter as is desirable for ready reference, and from the floor any articles which are not conducive to the primary purpose in this room of convenience of the members of the Society.

After discussion, the motion was voted upon and lost.

The report of the Curators presented at the last meeting of the Society was read.

The following motion of Dr. Morris, offered March 18th, was then taken up and considered.

"*Resolved*, That the Secretaries be requested to ask from the Academy of Natural Sciences, the Numismatic and Antiquarian Society and the Historical Society, the return of all the articles belonging to this Society that are now deposited with them."

And after discussion the portion relating to the deposit of the coins of the Society with the Numismatic and Antiquarian Society was withdrawn.

The following resolution was then offered as an amendment by Mr. Williams:

Resolved, That the resolution be referred to the Curators with instructions to report a plan for cataloging and labeling the Poinsett and Keating Collection, and of placing it where it will best serve the purposes of ethnological study.

The amendment was agreed to by a vote of 13 to 7.

The following gentlemen were declared duly elected members of the Society:

2203. Mr Harold Goodwin, Philadelphia.
2204. Mr. Joseph D. Potts, Philadelphia.

And the Society was adjourned by the President.

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXX. DECEMBER, 1892. No. 139.

On the Mutual Relations Between the Orbits of Certain Asteroids.

By Daniel Kirkwood, Riverside, Cal.

(Read before the American Philosophical Society, September 2, 1892.)

The present writer, several years since,* called attention to the fact that in some parts of the asteroid zone the orbits of particular members have a striking resemblance to each other. These significant coincidences have been regarded by astronomers as worthy of study, and, in addition to the binary and ternary clusters pointed out by the writer, others have been designated by Tisserand,† of Paris, and by Monck, of Dublin.‡ These groups, according to the former, cannot be regarded as chance arrangements. "A glance at the list," says Mr Monck, "will show that the resemblance frequently extends beyond a single pair and embraces what may be called a family—a circumstance which is known to occur in the case of comets also." The writer's list (which might be extended) is as follows:

GROUPS OF ASTEROIDS.

	NAMES.	a	e	i		π	
I.	Huberta ..	3.4586	0.1108	6°	16′	319°	45′
	Hermione	3.4585	0.1356	7	36	357	38
II.	(106) Dione	3.1670	0.1788	4	38	25	57
	(104) Clymene .	3.1560	0.1407	2	53	69	60
	(171) Ophelia....	3.1554	0.1149	2	34	148	31
	(62) Erato	3.1241	0.1765	2	12	39	0
	(257) Silesia	3.1190	0.1917	3	40	65	16
	(212) Medea .. .	3.1157	0.1013	4	16	86	18
	(86) Semele.....	3.1015	0.2193	4	47	29	10
	(303)	3.0973	0.1927	4	26	104	37
	(245) Vera.......	3.0966	0.1975	5	11	27	48
	(223) Rosa.......	3.0937	0.1206	1	59	106	35
	(268) Adorea	3.0858	0.1285	2	25	164	45

* 1880. † Annuaire, 1891. ‡ Sid. Mess., October, 1892, p. 334.

	Names	a	e	i		π	
III.	(238) Hypatia ...	2.9081	0 0876	12°	28′	28°	24′
	(191) Kolga.	2.8967	0.0876	11	29	23	31
IV.	(1) Ceres	2 7673	0 0763	10	37	149	38
	(237) Cœlestina	2.7607	0.0736	9	46	268	49
V	(116) Sirona .	2.7669	0 1433	3	35	152	47
	(278) Paulina ...	2.7575	0 1331	7	50	199	53
	(213) Liliaea	2.7563	0 1437	6	47	231	4
VI	(206) Hersilia ..	2.7409	0.0389	3	46	96	44
	(203) Pompeja	2 7376	0.0587	3	13	49	51
	(160) Una......	2 7287	0.0624	3	51	55	57
	(301) Bavaria	2 7208	0.0660	4	53	24	4
VII.	(97) Clotho .	2 6708	0 2550	11	46	65	32
	(3) Juno.....	2.6683	0.2579	13	1	54	50
VIII.	(246) Asporina .	2.6947	0 1050	15	38	256	6
	(218) Blanca. ..	2.6653	0 1155	15	13	230	14
IX	(66) Maia	2.6454	0 1758	3	6	48	3
	(37) Fides	2.6440	0.1750	3	7	66	26
X.	(193) Ambrosia .	2.5753	0 2854	11	38	70	52
	(134) Sophrosyne	2 5647	0.1163	11	36	67	33
XI	(79) Eurynome .	2.4436	0 1945	4	37	44	33
	(19) Fortuna.. .	2.4415	0 1594	1	33	31	3
XII.	(249) Ilse ..	2 3796	0 2193	9	39	14	16
	(115) Thyra.... .	2 3791	0.1939	11	35	43	2
	(84) Clio	2.3629	0.2360	9	40	339	20

NOTE.—a, e, i and π represent the distances, eccentricities, inclinations and perihelia respectively

REMARKS

1. The second cluster has eleven known members, the average inclination being about 8° 33′, that is, no one differs from the mean as much as 2°. Of the other groups, several are not less striking in the closeness of their relations.

2. When the earth, as well as Mars itself, was yet a part of the solar atmosphere, these individual planetoids were starting on the paths prescribed them. Into how many nebulous fragments they may have been subdivided, and to what extent these ramifications may yet be traced, let the astronomer of the future inquire.

Further Notes on the Betoya Dialects, from Unpublished Sources.

By Daniel G. Brinton, M.D., LL.D.

(*Read before the American Philosophical Society, October 7, 1892.*)

Last spring the Librarian of the Lenox Library, Mr. Wilberforce Eames, called my attention to a manuscript in that collection, with the following title: "*Arte de lengua de las Misiones del Rio Napo de la Nacion Quenquehoyos, y idioma general de los mas de ese Rio, Payohuates, Gennehuates, Ancoteres, Encabellados. Juntamente tiene la doctrina Christiana en dicha lengua y en la del Ynga. Al remate.*"

It is a duodecimo of seventy-five leaves, complete, clearly written, and dated at the close "Mayo 4 de 1793." It begins with a brief exposition of the grammatic principles of the language, and follows with a vocabulary of about 1700 words, covering 34 leaves. At the close are versions of the Doctrina in the same tongue and in the Kechua. Through the kindness of Mr. Eames I had opportunity to examine the MS. carefully, and to make from it a number of extracts which enable me to present the subjoined sketch of the language.

The stock to which it belongs is one concerning whose grammatic character the material hitherto available has been quite meagre. In a former contribution to the Proceedings of this Society I have shown that what are distinctively known as the Rio Napo dialects belong to the Betoya linguistic stock, and are affiliated with others which can be traced over ten degrees of latitude, from 3° south to 7° north latitude.

The dialect presented in the present MS. is a comparatively pure and well-marked member of the stock, and is nearly related to the Correguage of the head waters of the Caqueta and Putumayo rivers, of which vocabularies have been published by different travelers.

By Hervas, and a number of other writers who have copied from him, these Rio Napo dialects have been classed with the Zaparro stock, with which they have no relationship whatever.

Nouns.

Nouns are usually employed with suffixes denoting relation which allow them to be arranged with a resemblance to declensions.

Following the analogy of the Latin Grammar, the author presents five such declensions of masculine and feminine nouns, with some variations for neuters. The endings of his oblique cases are as follows:

Case Endings.

Declension.	1	2.	3.	4	5
Genitive,	*co,*	*qua,*	*ye, qua,*	*ye,*	*ho*
Dative,	*ni,*	*ni,*	*ni, pi,*	*ni,*	*ni.*
Accusative,	*nam,*	*te,*	*te,*	*te,*	*te*
Ablative,	*pi, pio, nam,*	*pi, pio,*	*pi, pio, ant,*	*pi, are, ant,*	*pi, na.*

The plural is formed by reduplication, or by the general termination *sca* or *cca*, which means "all;" or *guati*, or, for inanimate objects, *na*

The ablative suffix, *pi* or *pio*, is instrumental, *are* signifies accompaniment.

The termination *na or nam* of the accusative indicates motion.

The following example of a noun of the first declension will be a sufficient illustration

Signa-ye—music

	Singular	Plural.
Nom.,	*siguaya,*	*siguayesca.*
Gen.,	*siguaco,*	*siguaquinasca.*
Dat.,	*siguaconi,*	*siguanisca.*
Acc.,	*siguaconam,*	*siguatesca.*
Voc.,	*siguaye,*	*siguaquenasca*
Abl.,	*siguayepi,*	*siguapisca.*

Gender

This language is remarkable for the well-defined distinction it presents between masculine and feminine forms. The feminine termination is *o*, which, by assimilation, may also modify other vowels. It is present in both nouns, adjectives and pronouns; *e. g.*:

He is a bad man, *ha quaque paih.*
She is a bad woman, *y-o coaco romio.*

The masculine and feminine forms can also be applied to inanimate objects.

This thing (masc.), *i-ie.*
This thing (fem.), *i-o*
That thing (masc.), *ha-y*
That thing (fem.), *ho-co.*

There is no regular termination to nouns which distinguishes the

animate from the inanimate classes. Nevertheless, such a distinction is clearly recognized in the tongue; and also the distinction between rational and irrational beings.

The termination *pi* indicates animate rational beings, singular or plural; as, *pain pi raye*, some people are coming.

The termination *guati* or *huati* (*guay* or *huay*), is the plural for animate beings, whether rational or irrational, masculine or feminine, as, *Quito huati*, people of Quito, *romi-huati* or *nomio guay*, womenfolk

The plural termination for inanimate beings is *na*; as, *sonque-na*, the trees

Other plurals are irregular.

Pronouns

The same forms servs for both personal and possessive pronouns.

I, my,	*ye* or *ye pi*.
Thou, thine, thy,	*mue*.
Thou thyself,	*mus-repa*.
That one (masc.),	*ha*, or *an*, or *haon*
That one (fem.),	*haon*, or *aon-pi*.
She,	*y-e*.
We, our (masc. and fem.),	*may*, or *yeque*, or *yequepi*.
You, your (masc. and fem.),	*muea*.
They, their (masc. and fem.),	*imbue*.

Examples:

My clothing, *ye-en*.
Thy wife, *mus-rene*, or *mus-nese* (from *ezhe*, wife)
It is my son, *yeque çisa-e*

Numerals.

1, *Tey* (masc.), *teo* (fem.), only one, *teirepa* (one itself).
2, *Cayapa*.
3, *Toesumba*.
4, *Cajesea* (2 with plural termination)
5, *Tsente* (hand).
6, *Teyentetay* (hand + 1)
7, *Teyente cayapa* (hand + 2)
8, *Teyente toesumbe* (hand + 3).
9, *Teyente cacsea* (hand + 4).
10, *Caya ente*, or *caya huenã* (two hands)
11, *Caya ente-tey* (two hands + 1).
15, *Toesumba-ente* (three hands).
16, *Toesumba-ente-tey* (three hands + 1).
20, *Cacsea ente* (four hands).

Particles.

Like other languages of this class, much of the force of the expression depends on the use of certain particles, employed as prefixes, suffixes or infixes. The following examples will suffice.

Hua, causative, as, I smell (I observe an odor), *ye esi*.
I smell (I cause an odor), *ye huasi*
Eagi, expresses desire or wish
Cono, to drink, *cono-eagi*, I want to drink.
Caye, has an imperative sense
Yere, to cut, *yere-e-caye*, to order to cut.
Mapay, indicates negation
He comes, *rayge*; he comes not, *ray-mapay-ge*
Que, *co*, *na*, *ni* are particles of interrogation

Terms of Consanguinity

A number of these are given, but their distinction is not well explained

My father, *ye aque*, or *huraque*, or *aqma*
My mother, *ye-aco*, or *hucaco*, or *acoma*.
My son (child) *ye-mamaque*, fem *e-mamaco*; or *ye senque*, fem *ye senco*.
My grandfather, *ye ro o*, or *nenco-e*
My grandmother, *ye coe-o*, or *nenco-o*
My uncle, *ye pereque*
My aunt, *ye puere*

On the use of these the author adds the following note.

"Lo comun es que los tios á sus sobrinos dicen hijos, y los sobrinos padres los suegros hijos los hermanos tios y cuñados de hermanos."

Verbs.

Conjugation of the verb oye, *to love*

Present

I love, *ye oya*.	We love, *may onik*
Thou lovest, *oye mue*.	You love, *musa oy'ye*
He loves, *an oyni*.	

Imperfect

I loved, *ye ouha*	We loved, *may ouahue*.
Thou lovedst, *mue ouhue*.	You loved, *musa oyei senha-e*.
He loved, *heque ouha*	They loved, *an guati ou huapa*.

Preterit.

I have loved, *yeohue*	We have loved, *may oyei queae*.
Thou hast loved, *mue oyeiqueco*.	You have loved, *musa oyei queae*.
He has loved, *ian oyei queae*	They have loved, *an guati oyeiesa e*

PLUPERFECT

I had loved, *ye oy paa*, etc.

FUTURE.

I shall love, *oyaí ye*.
Thou wilt love, *oyyen mue*.
He will love, *oyaipi yan*.
We shall love, *omaí yeque*.
You will love, *oiní muaa*.
They will love, *oyeipi yan guati*

IMPERATIVE.

Love thou, *oyaí mue*

Verbs can be formed from nouns or adjectives by adding the particle *gi*; as,

Smoke, *pia*; it smokes, *piagi*.

THE LORD'S PRAYER.

1 *May aque matemote payque.*
Our father heaven-at is there.
2 *Mue mami oisique pao*
Thy name be sacred
3. *Mue payquero rauyena.*
Thy kingdom come
4. *Mue yeye neçique paye.*
Thy will on earth rule
5 *Omaje sohuay matemote nasique paye*
Even as thy holiness in heaven (and) on earth rules
6 *Aunre yure omanaepi mayni insigen*
Give to eat to day as to us each day
7 *May coayreoere huaneyeyen*
Our sins pardon.
8 *Omaje may huanenun.*
Even as we pardon.
9 *Tin huati mainre coayocere.*
Those who us sin against
10. *Coayeyete mainre tantahe.*
Doing evil us keep from.
11. *Zea coayete mainpi pirahe.*
All evils us from deliver.

Notes

1 *Matemote* appears to be a locative reduplicated form from *emue*, above, *payque*, to be in a place.

3. *Payquero*, from *paia*, man, master; *quero*, place or town; *rauyena*, from *raye*, to come.

4. The phrase "Creator of heaven and earth" is translated *matemote yejare neciquete*.

5 The words *neçique paye* seem to be repeated by error.

6 *Aunre*, from *aunne*, to give to eat, derived from *anye*, to eat; *insigen*, from *sia*, day, another word for day is *munçe;* both are evidently from *uçe* or *ense*, sun.

7. *Coayocere*, sins, from *coa* or *qua*, bad.

8 *Huanienau;* the vocabulary gives *huaneyeye*, to pardon.

10. *Coayoye* or *coayone*, evils, *coayeteyoye*, to commit sin

11. *Pirahe*, deliver; so in the Signarse, "Deliver us, O Lord," *mainpi pirahe may aque Dios*

The following is the version in "Encabellada," given from the Mezzofanti Collection in Teza's *Saggi Inediti de Lingue Americane* (Pisa, 1868)·

May ake matemote payque mue mamí, oyoique paye mue paykere: maynî rayyen mue yeye naxique paye ezanie yosana, matemote yoygi. Sia omuncepi aunre maynî inoigen may quayeyocere guaniyenigen ezanie may quayeyocehuatire guaniyenichaññu: quayeyote maypi pirayyen siaqua quachacere maynî rebayyen.

It is evident that this is the same dialect, but a version by a different hand, in which a varied phraseology has at times been adopted.

Vocabulary.

Above, upon, *emue*.
Alive, living, *huaje*
All, *sia*, or *siaye*, or *sea*.
Ashes, *unia*.
Bad, *coa*.
 It is bad, *qua gi*.
Beard, *sebi*, *sehue*.
Before, *yekun*.
Belly, *apue*, or *siapue*.
Below, *dea*, *ocare*, *huehua*.
Bird, *pi-ha*.
Black, *neaque*, or *neaseye*.
Blood, *si-e*.
Blue, *pecore*
Body, *juru*.
Bone (of animals), *huay tarapue*.
 (of man), *pain tarapue*.
Boy, *sin* or *siba-e*.
 (fem) girl, *siba-o*
Bread, *haun*.
Breast, *cutihue*.
Brownish (mondo), *cariri*.
Build, to, *enene*
Burn, to, *eye*, or *soye*
Canoe, *yogue*, or *comu*
Come, to, *raye*, or *rayge*, or *mane*.
Cotton, *yei*, or *yeg-y*
Dance, to, *vereye*, dr *nanuye*, or *nemoeye*.
Dead, *juyneique*, or *junçe*.
Deity, *ayreaque*.
Dog, *yay*, or *gho-pe*
Drink, to, *unouei*.
Earth, land, *yere*.

Ears, *oazero*.
Eat, to, *anya*.
Egg (raw), *hua jesia*.
(cooked), *guaco jesia*
Enemy, *juajo pain*, or *guate pain*.
Eyes, *nañqua*, or *nañcoca*.
Face, *si-a*.
Father (spiritual), *patri*.
(natural), *jaqua*, or *vacaque*.
Feather, *ca*.
Female, *romio*, or *nomio*.
Finger, *monè*.
Fire, *toa*.
to light a fire, *toare soanū*.
Flesh, meat, *kuay*
Flower, *sasa*.
Flute, *hatuhue*.
Foot, *nenya*, or *neneaya*.
Foretell, to (by magic), *siniare oaya*.
Forehead, *siatarapue* (see "Face," "Belly").
Go, to, *saiya*.
Green, *huaxa*.
Guacamayas, *ma* (= red, from the color of the plumage)
Hamack, *ham*, or *homac*.
Hand, *hente*.
right hand, *hoja gente*
left hand, *ari gente*.
Head, *enumbur*.
Hear, to, *hachaya*.
Heart, *ahua*.
of animals, *sere*.
of inanimate things, *joya*.
Heat, burning, *nçe*.
Horn, of animals, *cene*.
as a wind instrument, *ruruhue*.
Hot, *raca*.
House, *hue*.
new house, *mama hue*.
old house, *punca hue*.
to build a house, *hue enene* (see "To make")
Husband, *ayha*, or *paque*, or *yohemue*.
Image, idol, *toyaca*.
Iron, *quena*.
Jar, *qua curo*
Kill, to, *huaye*
Know, to, *qunahaye*
Lake, lagoon, *sitara*, or *copora*, or *guayra*.
Lance, spear, *huy*.
Light, *toa*, or *seunes toa* (= fire)
Lion, *mayay*
Maize, *hea*, or *husha*.
young, *huinia husha*.
pounded, *enta cra*.
roasted, *jarese sea*.
Make, to (hacer), *yeye*, or *nene*
Male, *emue*.
Man, *pain*, or *hain*.
Master, *paque*.
Mat, *punti*.
Milk, *oge*.
Moon, *nianàg*, or *pain*.
the moon shines, *nànag meagi*.
full moon, *nanà tubetetagui*.
Mother, *aco*, or *bucaco*, or *hacoma*, or *jacore*.
Mouth, *heope*
Nail, of finger, *oco*
Name, *mami*.
Name, to, to call, *cuymiane*.
Navel, *sumjupue*.
New, *mama*.
Night, *nàmi*
Nose, *uncuepue*, or *aquecoe*, or *un-eye*.
Old man, *aypue*.
Old woman, *a yo*, or *punq-yo*.
Pardon, to, *huaneyeye*, or *tauye*.
Parrot, *huae*.
People, person, *pain*
hostile people, *guato pain*.
friendly people, *coi pain*.
Perish, to, *ohaye*, or *xuxu ohaye*
Place, *roeua*, or *quero*, or *taco*, or *rora*.
Poor, *yehui*.
Pretty, *ayreo*, or *aydeogo*.

Rain, *boe* (= water).
It rains, *bcool*.
Red, *ma*.
bright red, *malay*.
Relation, male, *soyque*.
female, *zoyoe*
Road, *ma-a*.
Round, *cahua*.
Salt, *kesi*, or *ansi*, or *quena ocha*, or *o-a*, or *tese*.
to salt, *ansi pogenaye*
Scorpion, *puny*.
See, to, *inaye*
Seed, grain, *ea*.
Servant, slave, *joya*.
Shaman, priest, *sinlapain* (see "To foretell")
Shoulders, *cle*
Silver, *rehua*.
Sin, *coa-yoye* (see "Bad")
Sleep, to, *cane*
Smell, to, *yaye ye*
Small, little, *arimanis*.
Smoke, *pia*.
Soul, *joye* (see "Heart").
Spittle, *co-o*
Spring, fountain, *oco renia* (see "Water")
Star, *manhco*.
the Pleiades, *ese po*
Stick, *tarapue*
Stone, *quena*.
Straw, *taye juiaa*.
Sun, *nço*, or *ense*.
the sun rises, *nço anataji*.
Talk, to, *n caye*, or *cocacaye*.
speech or words, *caye*.
language, *coca*.
Thief, *naaque*.
Tiger, *ayro-yay* (see "Woods," "Dog")
Time, *rem*.
Tobacco, *musio*
in powder, *sea*, or *mena musio*.
To-day, *yura*.
Tongue, the, *semeno*, *someyo*
Town, village, *quero*, or *taco*, or *raripue* (see "Place")
Turtle, *cohua*, or *puca*, or *taseya*.
Urine, *cone*
Water, *oco*
drinking water, *ecoraca*
clear water, *ocoitaye oco*
Weight, *requesi*.
to weigh in a balance, *euencuesi*.
Wind, *tutu*
Wish, to, *yoye*.
White, *poo*
Woods, forest, *ayro*, or *mue*.
Yellow, *sene*, *sanio*, or *paco*
Yesterday, *niamina*.

On the Phylogeny of the Vertebrata.

By E. D. Cope.

(Read before the American Philosophical Society, October 7, 1892.)

I have traced the origin* of the Mammalia to the Theromorous reptiles of the Permian epoch, for the following reasons. The latter include the Pelycosauria, Cotylosauria, Procolophonina and perhaps other orders. In both classes there is only one postorbital arch of the skull, and this is the zygomatic. In both (excepting Prototheria and Procolophonina †)

* Proceeds. Amer. Philos. Soc., 1884, p. 42.
† Seeley, Philos. Trans. Royal Soc., 1889, 269.

the coracoid element is of reduced size, and is coössified with the scapula. In both (except Cotylosauria) the capitular articulation of the ribs is intercentral. In both, the humerus has distal condyles and epicondyles, and there is an entepicondylar foramen in the Pelycosauria as in the lower Mammalia. The posterior foot is constructed in the Pelycosauria almost exactly like that of the Prototheria. The single occipital condyle of the reptiles is not found in the Mammalia, but in some of the Lacertilia (Uroplates, Gecco) there are two condyles, the median (basioccipital) portion of the single condyle being rudimental. The Pelycosauria could not, however, have given origin to the Prototheria, since in that subclass of mammals there is a well developed coracoid. But in the Procolophonina this element is developed as in the Prototheria. Moreover, the Pelycosauria and the Procolophonina have the interclavicle, which is an element of membraneous origin, while in the Prototheria we have the corresponding cartilage bone, the episternum. This element is present in the Permian order of the Cotylosauria, which is nearly related to the Pelycosauria. This order has, however, single headed ribs, springing from the diapophyses, which is not usual in the Mammalia. But in some Cotylosauria the diapophyses are short, and in the Monotremata the postcervical ribs are single headed, so this character may not prove an insurmountable one. It is evident that the Mammalia were derived from some type probably referable to a Permian reptilian order of the Theromorous series, although to which one is not yet known.

The Reptilia have been supposed by Hæckel to have taken their origin from the Batrachia. I have indicated that it is probable that the Batrachian order, which stands in this relation to the Reptilia, is the Embolomeri of the Permian epoch. This conclusion rests on the following considerations. The Reptilian order of the Cotylosauria approaches the Batrachia of the subclass Stegocephali in the overroofing of the posterior regions of the skull, in the presence of vomerine teeth, and in the absence of obturator foramen of the pelvis. In some Cotylosauria (Diadectidæ) the stegocephalian intercalary bone of the skull is well developed. But in the Cotylosauria, the vertebral column consists mainly of centra, while in the Stegocephali it consists entirely or partly of intercentra. But in the Embolomeri the centra are well developed, and are larger than the intercentra anterior to the pelvis. Hence this is the only order of Stegocephali from which the Reptilia could have been derived.

Hæckel derived the Batrachia from the Dipnoi (Dipneusta), and I followed him in this belief, being strengthened in it by Huxley's ascription of an autostylic suspensorium of the mandible* to both divisions. This phylogeny is questioned by Pollard † and by Kingsley ‡ who would see the ancestry of the Batrachia in the Crossopterygian fishes on embryological grounds derived from a study of Polypterus. In support of their

* Proceedings Zoölogical Society of London, 1876, p. 12.

† Anatomischer Anzeiger, vi, p. 338, 1891.

‡ American Naturalist, 1892, p. 679. Kingsley would also derive the Dipnoi from Crossopterygia.

view I would cite the absence of the maxillary arch in the Dipnoi, and its full development in the Stegocephali, which are the ancestral Batrachia. The large development of the dorsal and anal fins in the Dipnoi is not favorable to the Haeckelian view; nor do the paired fins approach as nearly to the limbs of Batrachia as do those of some other fishes. It has been shown by Huxley that the suspensorium of the Batrachia is hyostylic in its earliest stages, and that it becomes autostylic at a later period of development. The Batrachia may then have originated from a hyostylic Teleostomous fish; *i. e.*, one with complete maxillary arch. Among Teleostomata we naturally look for forms with limbs which approach nearest the Batrachian type, and in which median fins are feeble or wanting. Such are the Rhipidopterygia, which include the families of Holoptychiidæ, Tristichopteridæ, Osteolepididæ, Cœlacanthidæ and perhaps some others. These families, except the last, abounded in the waters of the Devonian period, at the time when the ancestors of the Batrachia also

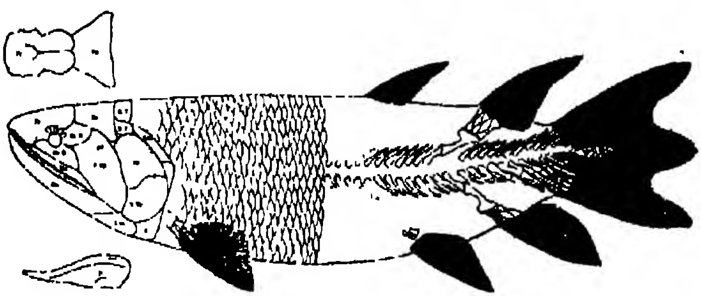


Fig. 1. *Eusthenopteron foordii* Whiteaves, ½ natural size. Devonian of New Brunswick. From Whiteaves.

existed. All of them agree in possessing the median fins of greatly reduced proportions, and the mesodermal or internal elements of the paired fins more like the limbs of the Batrachia than are those of any known fishes. The constitution of the superior cranial wall is a good deal like that of the stegocephalous Batrachia. The characters of the fins can be learned from the accompanying figure of the *Eusthenopteron foordii* Whiteaves, one of the Tristichopteridæ. The pectoral fin well-nigh realizes Gegenbaur's theory of the derivation of the Chiropterygium from the Archipterygium.

The question of the ancestry of the Batrachia cannot be considered to be yet settled.

The ancestral type of fishes is probably the Ichthyotomous order of the subclass of sharks (Elasmobranchii).* They are hyostylic, and have cranial

*Cope, Proceedings Amer. Philos. Soc., 1884, p. 585.

segmentation, the basioccipital element being conspicuous. The fins are all primitive, and those of all other types of fishes might have been derived from them. Opposed to this estimate of their relation to other vertebrates is the fact that they have not been yet found prior to the Carboniferous period. But our knowledge of the fishes of the Devonian is yet very imperfect. The types ancestral to the Pisces must have existed in the Silurian, and forms which may well have fulfilled this function have been discovered there. I refer to the Agnatha, which have been traced to the summit of the Devonian. The Silurian Agnatha are the Pteraspididæ, which display the lowest type, and the Cephalaspididæ, and these were succeeded by the Pterichthyidæ in the Devonian. There is a wide gap between these forms and any of the fishes, and nothing can be affirmed plausibly with regard to the phylogeny. There are superficial resemblances between the dorsal and ventral dermal scuta of the Pterichthyidæ and the Arthrodirous Dipnoi, but there is no considerable affinity between those divisions.

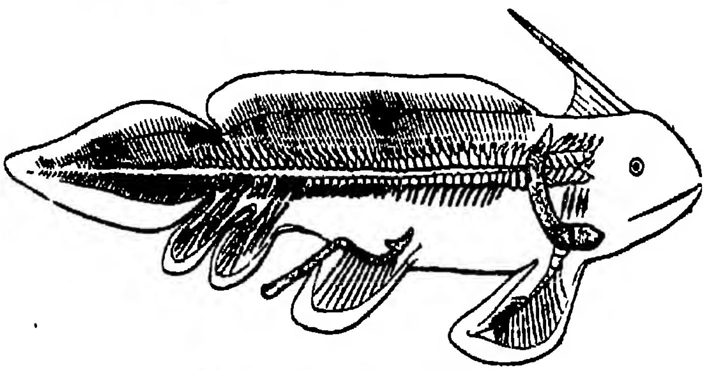


Fig. 2. *Xenacanthus decheni*, one of the Ichthyotomi, restored by Dr H E Sauvage. From the Coal Measures of France.

The extinct Agnatha agree with the existing lampreys in the absence of lower jaw and pectoral (scapular) arch, and both must be traced, in accordance with Hæckel's phylogeny, to the Acrania, which is now represented by the amphioxus (genus Branchiostoma). This order is easily the ancestor of existing Vertebrata, and shows points of resemblance to both Tunicata and worms. It has been suspected by Dohrn to have undergone degeneration, which may have been the case, since this phenomenon is so abundantly exhibited by both Tunicata and worms. It is not difficult to believe with Kowelewsky, that the Acrania were derived from the Tunicata. Semper has suspected, on the other hand, that the ancestors of the Vertebrata are to be found in the Annelide worms.

On Some Points in the Kinetogenesis of the Limbs of Vertebrates

By E. D. Cope.

(Read before the American Philosophical Society, October 7, 1893.)

The following paper is designed to supplement some omissions from my previous discussion of this subject in the memoir "On the Mechanical Causes of the Origin of the Hard Parts of the Mammalia."*

I. The Segmentation of the Chiropterygium

The segmentation of the limbs in the Vertebrata is a simple mechanical problem. Paleontology and embryology concur in proving that the limbs originated in primitive folds in the external integument, and that their connection with the internal skeleton was of later accomplishment. At first free, they sought points of support on the skeleton, but did not lose their free mobility when this contact was attained. Appropriately to the mechanical conditions of rigidity and flexibility necessary to their use in a fluid medium, they were originally composed of slender rods which were segmented by interruptions at suitable points. The articulations of the fin rays of fishes have been made the subject of an interesting research by Ryder, who finds them to be fractures, due to flexures during motion in the water medium.† The limb of land vertebrates (the chiropterygium) was derived from one of the forms of fins (rhipidopterygium) of water vertebrates. This is the simple type of primitive fin displayed by the Paleozoic Teleostomi of the superorder Rhipidopterygia. Whether the subdivisions of the chiropterygium, the propodial, metapodial and phalangeal bones, etc., were divided from the primitive branches of the archipterygium, as held by Gegenbaur, or whether they have developed by sprouting from a simple axial series of segments, as held by Baur; or whether, as I have suggested, it is a derivation from the rhipidopterygian type of paired fin (Fig. 1, p. 280), is not yet decided. In either case, the limbs of the first land animals were segmented and flexible at the joints between the segments. The necessities of such limbs are twofold: first, to serve as supports when at rest or in progression; second, to be applied to the body in protection from enemies, or in aiding the functions of feeding, reproduction, etc. The first function requires principally mobility at the point of connection with the body. The second, flexibility at some point on the shaft of the limb. The two kinds of movements in question would conserve two principal points of flexure, and these would be for the fore limb, just what we find, the shoulder and elbow joints; and for the hind limbs, the hip and knee joints. The two median joints are directed in opposite ways, the elbow backwards and

* American Journal of Morphology, III, 1889, p. 137.

† Proceedings of the American Philosophical Society, 1890, p. 547.

the knee forwards. This diversity is clearly due to the diverse positions of the functioning regions. The opposite extremities of the alimentary canal, the posterior including the exits of the urogenital organs, requires that the fore limbs should bend forwards, and the posterior limbs backwards. And the constantly recurring necessity for the exercise of these flexures must necessarily have developed the appropriate articulations in preference to all others. The terminal flexure, that of the wrist or ankle, has been evidently due to a similar mechanical cause, viz., the flexure due to pressure of the weight of the body on the terminal segments when in contact with earth. The distal segments are the most slender in all types, and least able to maintain a linear direction under pressure, hence, they have flexed easily and thus the line of separation between leg and foot had its origin.

II. The Origin of the Crests of the Humeral Condyles.

I have already pointed out (*op. cit.*) the kinetogenetic origin of the tongue and groove articulations in the Mammalia.

An excellent example is furnished by the elbow joint of the Quadrumana and Diplarthra. In the lower Mammalia, including the Carnivora (*op. cit.*, Pl. ix, fig. A), the distal end of the humerus presents a submedian groove which receives the ulna, and on the inner side of it, a more or less convex surface, which is applied to the head of the radius. The coronoid process of the ulna is narrow and its dense bounding walls impinge on the broad face of the humeral condyle in flexion and extension, and transfers to it the force of impact when the foot strikes the ground. In either case, strong pressure has been brought to bear on the humeral condyle and it has yielded to the denser body of the ulna, thus forming the groove in question. In such Mammalia, the effect of the head of the radius on the humeral condyle has been similar and in the same direction, *i. e.*, upwards. The dense edges of the former have impressed themselves on the latter, while the unsupported middle portion has yielded in the direction of gravity, and the result is what we find, *i. e.*, a cup shaped surface of the head of the radius, and a convexity of the humeral condyle, adapted to it.

Among specializations of the elbow joint, I call attention to two. In the Quadrumana, the head of the radius, probably owing to continued supination of the manus, occupies a position at the external side of the coronoid process of the ulna, and impinges on the outer part of the condyle of the humerus. The concavity of its head and the convexity of the humeral condyle are visible as before, but a prominent tongue or keel, which has been called the intertrochlear crest, separates the ulnar and radial surfaces of the humerus. (Fig. B) This keel occupies the groove or interval which separates the head of the radius from the coronoid process of the ulna. It is plain that we have here another tongue and groove joint, produced by the mutual adaptation of parts, under strain, pressure and impact. The other extreme of elbow joint is found in

that of the diplarthrous Ungulata (Fig E). Here the head of the radius, while retaining its normal position on the inner side of the forearm, is extended to the external side of the ulna and even beyond it, adapting itself to the entire width of the humeral condyles The same structure is found in the specialized forms of both series of Diplarthra, the Perissodactyla and Artiodactyla. This expansion of the head of the radius appears to be in direct relation to the duration through long geologic ages of the impacts which have affected the limbs of these, the swiftest of the Mammalia. That the head of the radius should be spread so as to fit the entire surface of the humerus as an effect of continued impact, seems to be a mechanical necessity But in addition to this we find a tongue-and-groove adaptation in which the crest (which I have called the trochlear crest), articulates with a groove in the head of the radius. The internal articulation of the humerus with the radius has the usual form, convex and concave distad. The trochlear crest marks the external border of the olecranar groove of the humerus. But the external part of the humeral condyles is converted into a roller which is set off from the trochlear crest, by the abrupt contraction of its diameter, while the corresponding part of the head of the radius projects to fit it exactly.

A probable explanation of the form of this roller may be derived from a consideration of the almost identical structure of the metapodio-phalangeal articulation in the Artiodactyla. The internal and external sides of the distal metapodial condyles are not similar; a character very distinct in the Artiodactyla (Fig. E) This is simply due to the unequal pressure exerted on the two extremities of the condyle by the phalanges, owing to the divergent direction of the digits when serving as a support. In the distal end of the humerus, the same effect is seen, the external part of the condyle nearly resembling the corresponding part of the metapodial bones. This is traceable to the same cause, viz., the divergent position assumed by the forearm on the humerus, when the weight is supported on one *fore leg only* This brings the line of pressure through the external part of both the head of the radius and the humeral condyle (Fig. 49).

Although I have already given what is essentially the same explanation of this structure (*op. cit.*, p. 199), the above renders clearer some points

III Atrophy of the Ulna and Fibula.

Successive atrophy of the ulna and fibula is coextensive with reduction of the number of the digits in the ungulate Mammalia, and with the development of the digital patagium in the bats This is in broad contrast to the subequal development of the ulna and radius in the Cetacea, where the fore limb functions as the blade of an oar. The cause of the reduction of the two elements in the Ungulata is the restriction of the functions of the fore and hind limbs to the radius and tibia respectively. The distal extremities of the ulna and fibula in primitive Ungulata were sup-

ported by the external bones of the carpal and tarsal series respectively The reduction of the external digit deprives the external bones in question of their share in the support of the general weight, and consequently relieves them of impact, which now passes through the longer median digits which remain The median digits, on the other hand, support the radius and tibia through the medium of the carpus and tarsus, and it is these elements, therefore, which function in the use of the limb We have here an evident illustration of the effect of disuse in effecting the atrophy of an element, and of use in increasing the size and complexity of an adjacent element of the same organism No other explanation seems possible, for the elements which are reduced and those which are enlarged are subjected in every other respect to the same conditions.

On False Elbow Joints

By Prof E D Cope, Ph.D.

(Read before the American Philosophical Society, December 2, 1892)

I have in various papers formulated and defended the hypothesis that the peculiar characters of the articulations of the mammalian skeleton are due to mechanical causes operating throughout the ages of geologic time.* I had previously traced the succession of these modifications from simple reptilian types, through various stages, to the highly specialized and mechanically perfect structures seen in the higher Mammalia. The series of forms revealed by paleontologic research is so complete as to leave little doubt in the mind as to the manner and cause of their origin The theory thus derived, which I have called kinetogenesis, depends for its demonstration on two assumptions The first is that living osseous tissue is plastic, and is therefore readily modified in its form by impacts, strains, friction, etc , and the other is that one which is necessary to all evolutionary hypotheses, that acquired characters are inherited. I do not propose to discuss here the latter proposition, but I desire to offer some evidence in support of the former Marey tells us,† as a result of a study of pathological conditions of articulations, that "after dislocations the old articular cavities will be filled up and disappear, while at the new point where the head of the bone is actually placed, a fresh articulation is formed, to which nothing will be wanting in the course of a few months ; neither articular cartilages, synovial fluid, nor the ligaments which retain the bone in place."

Specimens demonstrating the truth of this statement of Marey are also

* *Origin of the Fittest*, 1887, p 368 *et seq.* ; "The Mechanical Origin of the Hard Parts of the Mammalia," *American Journal of Morphology*, 1889, p 146.

† *Animal Mechanism*, 1874, pp. 88, 89.

demonstrative of the truth of the doctrine of kinetogenesis. Two such have recently come under my observation—both of them cases of dislocation of the elbow joint. One of these is that of a man (No. 1888, Wistar and Horner Museum of the University of Pennsylvania), where the cubitus is luxated backwards. The other is that of a horse, where the cubitus is luxated outwards, which I owe to the kindness of Dr William B Wernitz, Vet., of Philadelphia. These specimens are especially instructive as exhibiting the different effects of different luxations of the same articulation.

Elbow of Man.

The human elbow, for which I am indebted to the authorities of the University of Pennsylvania, is so dislocated as to have allowed little flexion and extension during life, but the radius retained rotary motion. The humeral condyle rests on the ulna anterior to the coronoid process, and the head of the radius is in contact with the posterior side of the external epicondyle. It has resulted in consequence of the abnormal position of the humerus, that a new coronoid process has developed as far anterior to the true coronoid as the latter is anterior to the olecranon; and that a new humeral cotylus has appeared between the two coronoids whose fundus is considerably elevated above that of the old one. In consequence of the contact of the head of the radius, a deep cotylus has been formed on the posterior face of the external epicondyle and adjacent part of the condyle of the humerus, which is well adapted to the radial head. From both of these new cotyli I removed a layer of articular cartilage, and the osseous surface is as smooth and dense as those of normal articulations. The edges of the cotyli are not as smooth as those of the normal, but display the greater or lesser irregularities of unfinished osseous deposit, except the internal border of the radial cotylus of the humerus which is perfectly regular.

Remarkable exostoses accompany the development of the cotyli. The normal humeral cotylus of the ulna is partially filled with rough osseous deposit. The internal epicondyle of the humerus sends a process downwards and posteriorly towards this cotylus, which it does not reach, but projects freely. The external epicondylar region develops three processes of which the posterior and inferior anterior (distal) embrace the head of the radius, forming the posterior and anterior boundaries of the radial cotylus. Two ridges of exostosis of the shaft terminate at the posterior process. The superior anterior process is short, and projects freely distad. But a small portion of the condyle proper retains its articular surface; that is the posterior part of the internal condyle which articulates with the ulna. The remaining surface of the condyles is concealed by irregular bone deposits which quite obliterate its normal form, especially on the posterior (olecranar) surface, where the deposit is thickest and most irregular.

Elbow of a Horse.

I am informed by Dr Werntz that the horse with dislocated elbow lived for about two years after the accident, in the country, dying of pneumonia. It used the leg (the left one) to a moderate degree, walking on the extremity of the hoof, with the elbow everted.

It results from the dislocation, that the internal part of the head of the radius was in life without opposing humeral surface. The trochlear crest of the humerus rotated inside of the median ridge of the head of the radius, and the interior roller of the humerus projected freely within the internal border of the head of the radius. The external border of the humeral condyles corresponds to the trochlear groove of the head of the radius, which, of course, it does not fill Since the internal face of the olecranar process rotates on the external epicondyle of the humerus, it follows that the external face of the olecranar process has no contact and was unused

The mechanical result of this position of the parts is as follows The internal side of the olecranar process develops friction on the external surface of the external epicondyle of the humerus. The trochlear crest of the humerus produces the same along the inner side of the median crest of the head of the radius The expansion of diameter of the internal roller of the humerus produces friction on the internal edge of the head of the radius

The structural result may be divided into two divisions : *first*, those developed at points of contact of the parts thus abnormally brought together, and *second*, those which appear at points abnormally separated

Class First. (1) A large new facet is developed on the posterosuperior aspect of the external epicondyle of the humerus (*1a*, Figs 1 and 3), which lies in an arc continuous with that of the external roller (or condyle), and whose surface is directed downwards and outwards. It occupies the usual position of the external *flexor metacarpi* muscular insertion, which is in the normal humerus a truncate oval, looking downwards and backwards This surface has been almost entirely removed, the posterior face of the lateral rib of the humerus terminating below in an obtuse acumination, instead of the form described The form of the new facet is not entirely due to the planing down or absorption of this region The external epicondylar fossa is filled with exostoses, of which a large one in a superior position contributes material for the inferior part of the new facet. The posterior rib of the humerus is also exostosed so as to present a rough surface of greater transverse extent than in the normal humerus This mass overhangs the new olecranar facet, forming a guide to its free extremity in rotation, the latter thus running in an open groove. Thus is further luxation in a measure provided against.

(2) The internal half of the humeral facet of the olecranar process is narrowed, and its prominent internal rim rounded off; and it is con-

tinued to the radial articular surface, instead of being separated by an interruption as seen in the normal horse In extension and flexion the prominent posterior border of the new olecranar facet of the humerus rotates behind the humeral olecranar facet just described Posterior to this depressed surface there rises an abnormal bony crest which is concentric with the olecranar and humeral surfaces, and serves as a guide in extension and flexion of the crest of the humerus which moves in the surface in front of it, which becomes, through the presence of this crest, an open groove (*1c*, Figs. 4, 5)

(3) A triangular shallow facet is formed on the posterior part of the head of the radius corresponding to the trochlear crest of the humerus (*1f*, Figs. 2, 4)

(4) A corresponding facet appears on the posterior part of the trochlear crest of the humerus, which penetrates the dense layer (*1a*, Fig 1).

(5) The internal extremity of the humeral surface of the head of the radius is beveled off by the expansion of the internal roller of the humerus, forming a new facet of perfect articular character (*1b*, Figs. 1, 2, 4)

(6) A facet corresponding to (5) is developed on the internal roller at its middle, considered either transversely or anteroposteriorly It is of an elongate oval form, and its superior portion penetrates the dense layer (*1d*, Fig 1)

Class Second. (1) The trochlear groove of the head of the radius has nearly closed its anterior and posterior margins by osseous outgrowths the largest of which, the posterior, so fills it as to support the external part of the external humeral condyle in extension and flexion (*2a*, *2b*, Figs. 2, 4, 6)

(2) Exostoses exist on the external side of the humeral facets of the olecranar process, which fill part of the concave arc of the ulna, necessary for adaptation to the external border of the humerus in its new position (*2c*, Figs. 4, 6)

(3) At the internal and posterior sides of the head of the radius a mass of exostoses causes a considerable thickening of the bone. Its thickness on the internal side is just equal to the free projection of the internal roller of the humerus within the head of the radius It is not, however, built up to the plane of the head of the radius, and so does not yet support the humerus.

Summary.—As a result of the abnormal action of this luxated elbow we have the following production of new structures. Four complete new facets viz. · One on the humerus, one on the ulna, one on ulna and radius, and one on the radius. Two incomplete new facets on the humerus. The development of two new crests, which serve as guides to rotating margins. Second, the partial filling by exostosis of two unused facets, one on the ulna, and one on the radius; third, the filling by exostosis of an epicondylar fossa which serves to build out a new facet; and, fourth, the building out by exostosis of the head of the radius, which if

continued would have extended the head of the radius for adaptation to the inwardly luxated humerus

ETIOLOGY.—That the new structures described are due to the abnormal mechanical relations of the bones, will be questioned by no one. We observe three distinct processes of osseous metabolism due to these conditions. These are *First*, the removal of tissue from its original locality, and the substitution of dense tissue for spongy tissue at the point of removal This has been accomplished at three points A Where the inferior extremity of the external posterior rib of the shaft of the humerus has been largely cut away, in adaptation to the movement of the olecranar crest of the ulna, and a dense layer developed over the new surface thus produced. B Where the internal border of the head of the radius has been beveled off. C Where the internal face of the humeral facet of the olecranar process of the ulna has been planed down without exposing the spongy bone. That this process was not completed at some points is shown by the two new facets of the humeral condyles, where the dense layer is penetrated and no corresponding dense layer established on the spongy layer thus exposed (Figs 1d and 1e)

Second. The deposit of osseous bodies beneath the synovial walls where the bursa was kept expanded by the failure of the articular ends of the bones to maintain contact, as in the case of the trochlear groove of the head of the radius, and the external side of the humeral facet of the olecranar process of the ulna.

Third The development of exostoses at the insertions of articular ligaments and tendons at the following three points A At the insertion of the *flexor metacarpi externus* ligament, at the exterior border of the posterior face of the inferior end of the shaft of the humerus, which crest overhangs the new facet above described B Where the osseous crest is developed on the ulna, concentric with the interior humeral facet of the olecranar process C Where extensive exostosis appears on the internal side of the head of the radius. D, Where the external epicondylar fossa is filled with exostoses (other ligamentous exostoses at 3e, *f* and *g*, Figs. 1, 2, 4, 5)

From the above analysis we may derive the following conclusions as to the nature of the metabolism in the several cases

Class First Continued excessive friction removes osseous tissue from the points of contact until complete adaptation is accomplished and the friction is reduced to a normal minimum

Class Second. Where the normal friction is wanting, and an inflammatory condition is maintained by a pulling stress on the investing synovial membrane, excess of osseous deposit is produced.

Class Third. Stress on the articular ligaments and tendons stimulates osseous deposit at their insertions, which deposit may be continued into their substance This is a pulling stress.

CONCLUSIONS.—We find illustrated in these specimens three kinds of osseous structures which are observed in normal vertebrate skeletons.

These are, articular facets, osseous deposit at presumed points of irritation from various stimuli, and the development of bone at ligamentous and tendinous insertions. To the combination of the causes which produce the first and second effects we owe most of the secondary peculiarities of the vertebrate skeleton, and to the third we owe the fundamental construction of the skeleton on which the secondary modifications have been superposed. It is not important to our contention if the histological structure of some of the abnormal osseous deposits in our specimen may differ slightly from the normal tissues sought to be explained by it. This may be accounted for by the different circumstances to which the two sets of phenomena are due. In the dislocation the change from the antecedent state of the parts is violent and abrupt. In the evolution of the vertebrate skeleton the process was slow and gradual. In the cases of the luxations nature had to meet the changed conditions by correspondingly abnormal measures. In orderly evolution "*saltus non facit*." It may, however, be justly inferred, that if such characteristic structures can be produced in the space of months, how much more easy has it been for stimuli of allied character to develop the features of normal articulations during the ages of geologic time.

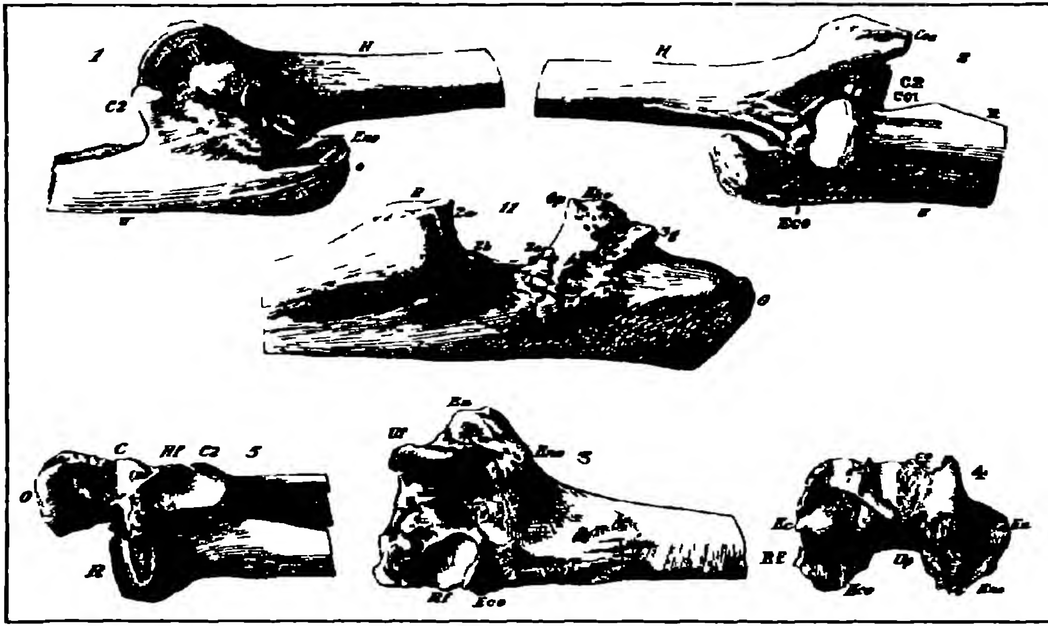
We have here, also, an instructive lesson as to the matter of inheritance. Every one knows that mutilations, luxations, etc., are not usually inherited. This is because they are not "acquired" in the proper sense of the word. Since characters truly acquired are inherited, it is evident that a long continuance of the stimulating cause is necessary to produce a true acquisition. The difference between a character produced by causes apart from the normal life of an animal and not repeated, and those produced by causes operating daily and hourly for geologic ages, is necessarily very great. And, as Prof. Scott* remarks, the latter have not been acquired during the lifetime of each generation, since they are found in the young before birth, before external stimuli have had the opportunity to exert their influence.

Explanation of Plates

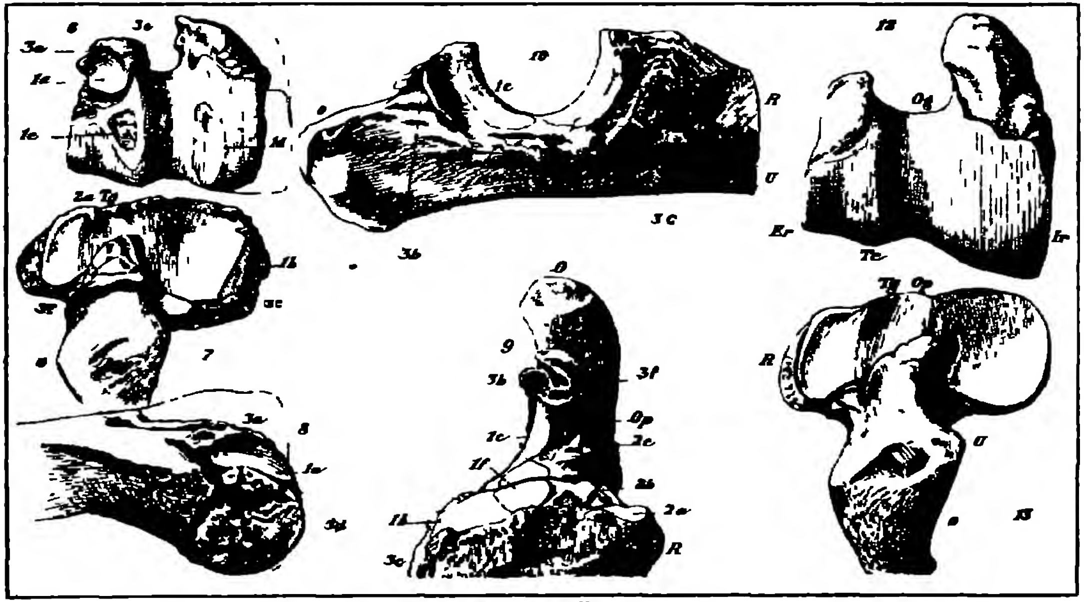
Figs. 1–5. *Homo sapiens*, luxated elbow joint; one half natural size.
1. Luxated elbow joint, from within.
2. Luxated elbow joint, from outer side.
3. Humerus, posterior view of distal region.
4. Humerus, distal view.
5. Ulna and radius, anterior (superior) view.

Lettering.—*H*, humerus; *U*, ulna; *R*, radius; *C*, coronoid process; *C'*, second (abnormal) coronoid process; *O*, olecranon; *Ee*, entepicondyle; *Ec*, ectepicondyle; *Eno*, entepicondylar exostosis; *Eco*, ectepicondylar exostosis; *Co*, condylar exostosis; *Cos*, superior condylar exostosis; *Co'*,

* "On the Osteology of Mesohippus and Leptomeryx," *American Journal of Morphology*, 1891, p. 385.



1–5. Homo sapiens 11 Equus caballus



Equus caballus.

inferior condylar exostosis; *Hf*, humeral facet; *Rf*, radial facet; *Uf*, ulnar facet.

Figs. 6–11. Bones of abnormal left elbow joint of horse, one half natural size.
12, 13 Normal bones of elbow joint of horse; one half natural size
6–12. Humerus, distal views.
7–13. Cubitus, proximal views
8. Humerus, external view of distal extremity
9 Humeral articulation of cubitus, from above
10. Cubitus, internal view
11. Cubitus, external view

Additional lettering.—*Op*, olecranar process of ulna, *Cp*, coronoid process of ulna, *Og*, olecranar groove of humerus, *Tc*, trochlear crest of humerus; *Tg*, trochlear groove of humerus, *Ehc*, external humeral facet of coronoid process, *Ihc*, internal humeral facet of coronoid process.

The lettering of the abnormal facets and exostoses in Figs 6–11 conforms to that of the same in the etiological classification on page 289

Stated Meeting, September 2, 1892.

Present, 8 members.

President, Mr. FRALEY, in the Chair.

The decease of the following members was announced:

M. F. Longstreth, Sharon Hill, Pa., December 27, 1891, æt. 78.

H. Burmeister, Buenos Ayres, May 6, 1892, æt. 86.

John R. Baker, Philadelphia, June 22, 1892, æt. 74

George William Curtis, New York City, August 31, 1892, æt. 68.

Correspondence was submitted as follows:

A letter accepting membership from Mr. Joseph D. Potts, Philadelphia, dated May 24, 1892.

A letter acknowledging receipt of diploma from Dr. Caspar René Gregory, Leipzig.

A circular from the R. Accademia delle Scienze di Torino,

announcing the death of its Vice-President, Prof Comm. Giovanni Flechia, June 3, 1892.

A circular from the Committee for the Erection of a Monument to the Memory of M. A de Quatrefages, inviting subscriptions for that purpose.

A circular from the Royal Society of N S Wales, offering its medal and £25 for the best communication containing the results of original research or observation upon the various subjects named.

An invitation from the Buffalo Historical Society to the unveiling of the statue of Red Jacket, erected by that Society, to take place June 22, 1892.

An invitation from the Deutsche Anthropologische Gesellschaft, to attend the Twenty third Congress, to take place at Ulm, August 1 to 3, 1892.

A circular from the American Chemical Society, New York, announcing the Fifth General Meeting, to be held at Rochester, N. Y., August 16 and 17, 1892

A program of meetings and excursions of the Sixth Session of the Congrès Géologique International, to take place at Zurich, in 1894.

Announcement of the Tenth Session of the Congrès Internationale des Orientalistes, to be held at Lisbon, September 23 to October 1, 1893

A letter from Mr. Lorin Blodgett, dated Philadelphia, July 16, 1892, enclosing memorandum of a project devised by his ancestor, Samuel Blodgett, for the formation of a National University, to be erected in Washington, D C

A letter from C. H Hart, Esq , giving reasons to show that the portrait labeled Francis Hopkinson was really that of Samuel Vaughan The communication was referred to the Curators.

Letters of envoy were received from the Australasian Association for the Advancement of Science, Sydney; Naturforsche Gesellschaft, Dorpat, Russia; Comite Geologique, Observatoire Physique Central, St. Petersburg; Institut Météorologique de Roumaine, Bucarest; Société R. Norvégienne des

Sciences, Throndhjem; Université Royale, Lund, Sweden, Musée Teyler, Harlem, Holland; Maatschappij der Nederlandsche Letterkunde, Leiden, Holland, Naturforschende Verein, Brünn, Austria; K. Akademie der Wissenschaften, Berlin; K. Sächsische Gesellschaft der Wissenschaften, Leipzig; Gesellschaft zur Beförderung der gesammten Naturwissenschaften, Marburg; Centralbureau der Internationalen Erdmessung, Potsdam, Prussia, Altertumsverein für Zwickau und umgegend, Zwickau, Saxony; École Polytechnique, Bureau des Longitudes, Musée Guimet, Paris, Meteorological Office, Royal Statistical Society, London, Eng, Royal Irish Academy, Dublin, Geological Survey of Pennsylvania, Harrisburg; U S. Fish Commission, Washington, D. C.; University of Wisconsin, Madison.

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Letters of acknowledgment were received from the Institut Egyptien, Cairo (185); R. Society of N. S Wales, Sydney (185); I. Academy of Sciences (186, 137), Russian Chemical Society, St Petersburg (136), Observatory, Taschkent (136); Université Royale, Lund, Sweden (182–136), Société Hongroise de Geographie, Budapest (136); K K. Central Anstalt für Meteorologie, etc. (137), K. K. Naturhistorisches Hofmuseum (136), Prof. Franz v. Hauer (134–137), Dr. Frederick S. Krauss (134–136), Drs. M. Much, Frederick Müller (136), E. Suess (185, 136), Vienna, Austria; Naturforschende Gesell-

schaft des Osterlandes, Altenburg (137); University, Bonn (136); Prof. H. von Helmholtz, Charlottenburg (132, 133, 135, 136, 137); K. Sächsisches Meteorologisches Institut, Chemnitz (96–130, 136, 137, and Catalogue Parts i–iv); Verein f. Erdkunde, Dresden (137); Naturforschende Gesellschaft, Emden (136, 137), Oberhess. Gesellschaft für Natur- und Heilkunde, Giessen (136), Naturhistorische Gesellschaft, Hanover (136), Verein der Freunde der Naturgeschichte, Mecklenburg (131–136); K. Sternwarte (130), Prof. J. Victor Carus (130), Dr. Julius Platzmann (137), Leipzig; Naturwissenschaftlicher Verein, Osnabrück (96–136, and Catalogue Parts i–iv), Prof. Dr. Johannes Dümichen, Strassburg (135); Royal Zoölogical Society, Natura Artis Magistra, Amsterdam (136); Royal Zoological and Botanical Society, The Hague (136), Tyler Museum, Harlem, Holland (136), Société Royale de Géographie, Antwerp, Belgium (134); R. Accademia dei Lincei, R. Comitato Geologico D'Italia, Prof. Guiseppe Sergi, Rome (136), Académie R. des Sciences, Prof. Guido Cora, Turin (136); Société D'Emulation, Abbeville (136); Société de Borda, Dax (136); Société des Sciences Naturelles and Archéologiques de la Creuse, Guéret (136); "Le Cosmos" (137), Musée d'Histoire Naturelle (134), Marquis de Nadaillac, Profs. Abel Hovelacque, Léon de Rosny (137), Paris; Mr. Samuel Timmins, Arley, near Coventry, Eng (137); Philosophical Society, University Library, Cambridge, Eng. (137); Mr. Alfred R. Wallace, Parkston, Dorset, Eng (137); British Museum of Natural History (128, 131, 132, 133, 137), Royal Society, Local Government Board, Royal Meteorological Society, Department of Science and Art, Royal Geographical Society, Royal Institution, Royal Astronomical Society, Linnean Society (137), Sir James Paget (137), Dr. W. H. Flower (128, 131, 132, 133, 137), Messrs. O. Juhlin Dannefeld, Charles G. Leland, Rawson W. Rawson (137), London, Eng.; Geographical Society, Manchester (137); Natural History Society, Newcastle-on-Tyne (137), Radcliffe Observatory, Prof. J. J. Sylvester, Oxford, Eng. (137); Royal Geological Society of Cornwall, Penzance, Eng (137); Royal Society, Royal Obser-

vatory, Edinburgh (137); Philosophical Society, Glasgow (137); Prof. James E Oliver, Ithaca, N. Y. (130, 137); Columbia College, Editors of "Popular Science Monthly," N Y Mathematical Society, Mr. James Douglas, New York (137); Geological Society of America, Rochester, N. Y (137), N J. Natural History Society, Trenton (137), Dr. Persifor Frazer, Mr. Joseph D. Potts, Philadelphia (137); Rev F A. Muhlenberg, Reading, Pa. (136, 137); Maryland Historical Society, Baltimore (137), Smithsonian Institution, Washington, D C. (540 packages, 137); Michigan Agricultural College, Ingham Co. (135, 136, 137); Kansas State Historical Society, Topeka (128), Sociedad Cientifica "Antonio Alzate" (127, 132, 133), Observatorio Astronomico N M., Tacubaya (137), Agricultural College of New Mexico, Las Cruces (137), Bishop Crescencio Carrillo, Merida, Yucatan (137), Museo Nacional, Buenos Ayres, S A. (135).

Letters of acknowledgment (138) were received from Mr. Horatio Hale, Clinton, Ontario, Hon. J M. Le Moine, Quebec, McGill College, Natural History Society, Montreal, Geological Survey, Ottawa, Canadian Institute, Toronto; Historical and Scientific Society, Winnipeg, Bowdoin College, Brunswick, Me ; Society of Natural History, Portland, Me , Prof. Charles E. Hitchcock, Hanover, N H., Vermont Historical Society, Montpelier, Hatch Experiment Station, Amherst, Mass., Mr. Robert N. Toppan, Museum of Comparative Zoölogy, Cambridge, Mass , Massachusetts Institute of Technology, State Library of Massachusetts, Boston Society of Natural History, Massachusetts Historical Society, Messrs. Hamilton A. Hill, Robert C. Winthrop, Boston, Essex Institute, Salem, Mass ; Rhode Island Historical Society, Providence Franklin Society, Providence, R. I , Mr. George F. Dunning, Farmington, Conn.; Connecticut Historical Society, Hartford; New Haven Colony Historical Society; Prof. James Hall, Albany, N Y.; Buffalo Library, N. Y ; Prof. E. North, Clinton, N. Y.; Profs. J. M. Hart, J. E. Oliver, B. G. Wilder, Ithaca, N. Y.; New York Hospital, Historical Society, Academy of Medicine, Columbia College, Entomological

Society, Mathematical Society, Astor Library, American Museum Natural History, University of the City of New York, "Popular Science Monthly," Prof J. A Allen, Messrs. James Douglass, R. W. Raymond, New York; Vassar Brothers' Institute, Poughkeepsie, N Y, Geological Society of America, Rochester, N. Y, U S Military Academy, West Point, N.Y.; Prof. Henry M Baird, Yonkers, N. Y; Mr Isaac O Martindale, Camden, N J; Free Public Library, Jersey City, N. J, New Jersey Historical Society, Newark; Prof. C. A. Young, Princeton, N J; Oneida Historical Society, Utica, N Y., Dr Robert H. Alison, Ardmore, Pa, Prof. Charles F Himes, Carlisle, Pa., Hon Eckley B Coxe, Drifton, Pa., Prof. M. H Boyé, Coopersburg, Pa., Profs Trail Green, Thomas C Porter, J W Moore, Easton, Pa; Mr Andrew S. McCreath, Harrisburg, Pa, Prof Lyman B. Hall, Haverford, Pa; Mr John Fulton, Johnstown, Pa., Linnean Society, Lancaster, Pa, Prof John F Carll, Pleasantville, N J.; Rev F. A. Muhlenberg, Reading, Pa, Rev G W. Anderson, Rosemont, Pa, Dr John Curwen, Warren, Pa; Mr. Philip P. Sharples, Hon. Washington Townsend, Philosophical Society, West Chester, Pa, College of Physicians, Academy of Fine Arts, Historical Society of Pennsylvania, Library Company of Philadelphia, Numismatic and Antiquarian Society, Engineers' Club, Wagner Free Institute of Science, Messrs. Charles Bullock, Henry C Baird, S Castner, Jr., Thomas M. Cleemann, Patterson Du Bois, Edward Hopper, Joseph S Harris, James T. Mitchell, Robert Patterson, Franklin Platt, J. D. Potts, J. G. Rosengarten, Theodore D. Rand, Coleman Sellers, L. A. Scott, D. K Tuttle, Louis Vossion, Charles Stewart Wurts, Ellis Yarnall, Mrs. Helen Abbott Michael, Profs. John Ashhurst, Jr., H. D Gregory, F. A. Genth, Jr, L. M. Haupt, H W. Spangler, Drs. W G. A. Bonwill, D. G. Brinton, George Friebis, Persifor Frazer, William Goodell, George R. Moorehouse, John Marshall, Charles A. Oliver, C. N. Peirce, W. S. W. Ruschenberger, Benjamin Sharp, H. Clay Trumbull, William H. Wahl, Philadelphia, Pa., Mr. William M. Canby, Wilmington, Del.; Maryland Institute, Baltimore;

Smithsonian Institution, U. S. Geological Survey, U. S. Coast and Geodetic Survey, Anthropological Society, Surgeon General's Office, Patent Office, Weather Bureau, Mr. W. B. Taylor, Dr. W. J. Hoffman, Profs. S. F. Emmons, C. V Riley, Charles A Schott, Washington, D C., University of Virginia, Prof J. W. Mallet, Charlottsville, Va ; Mr. Jed. Hotchkiss, Staunton, Va., Agricultural Experiment Station, Prof I. C. White, Morgantown, W Va ; Georgia Experiment Station, Experiment; Georgia Historical Society, Savannah, University of Alabama, Tuscaloosa; Agricultural Experiment Station, Baton Rouge, La.; Prof. J. C. Branner, Palo Alto, Cal ; University of California, Berkeley; Lick Observatory, Mt Hamilton, Cal , Prof. Daniel Kirkwood, Riverside, Cal ; Prof. E. W Claypole, Akron, O ; Ohio Archæological and Historical Society, Columbus; Cincinnati Observatory, O.; Davenport Academy of Natural Sciences, Iowa, State University, Iowa City, Iowa, Prof. J. L. Campbell, Crawfordville, Ind , Purdue Experiment Station, La Fayette, Ind.; University of Michigan, Ann Arbor; Michigan Agricultural College, Ingham Co ; Geological Survey of Missouri, Jefferson City; Prof. Herman Haupt, St. Paul, Minn , State Historical Society of Wisconsin, Madison, Kansas State Historical Society, Topeka, Agricultural Experiment Station, Manhattan, Kans ; Agricultural College of New Mexico, Las Cruces; Observatorio Astronómico Nacional Mexicano, Tacubaya, Don Mariano Barcena, Dr Antonio Péñafiel, Sociedad Cientifica "Antonio Alzate," Mexico

Donation to Cabinet—Phototype of Dr. Benjamin Franklin, from Mr. Julius R. Sachse, Philadelphia, Pa.

Accessions to the Library were reported from the R. Geographical Society of Australasia (Queensland Branch), Brisbane; R. Geographical Society of South Australasia, Melbourne; Royal Society of New South Wales, Australasian Association for Advancement of Science, Sydney; Royal Society of Tasmania, Hobart; Tokyo Library, Geographical Society; Royal Asiatic Society (Straits Branch), Singapore; K. Akademie der Wissenschaften, Comité Geologique, St.

Petersburg, Société Finno Ougrienne, Helsingfors; Société des Naturalistes, Kief; Société des Naturalistes, Odessa; Institut Météorologique de Roumaine, Bucarest, Naturforsche Gesellschaft, Dorpat; University, Lund, Sweden; K. Norske Videnskabers Selskab, Throndhjem; Naturforschender Verein, Brünn, Austria; K. K. Sternwarte, K. Böhmische Gesellschaft der Wissenschaften, Prag; K. Akademie der Wissenschaften, Geologische Reichsanstalt, K. K. Naturhistorische Hof-Museum, Vienna; Physiologische Gesellschaft, K. P. Geologische Landesanstalt und Bergakademie, Berlin; Naturwissenschaftlicher Verein, Bremen, Naturwissenschaftliche Gesellschaft (Isis), Dresden; Oberhessische Gesellschaft, Giessen; Naturhistorische Gesellschaft, Hanover, K. Gesellschaft der Wissenschaften, Gottingen; Gesellschaft zur Beförderung der Gesammten Naturwissenschaften, Marburg, Centralbureau der Internationalen Erdmessung, Potsdam, Altertumsverein für Zwickau und umgegend, Zwickau, Nederlandsche Maatschappij ter Bevordering van Nijverheid, Musée Teyler, Hollandsche Maatschappij der Wetenschappen, Harlem; Friesch Genootschap van Geschied-Oudheiden Taalkunde, Leeuwarden; Maatschappij der Nederlandsche Letterkunde, Leiden, K. Bibliothek, 's Gravenhage; Société R. Malacologique de Belgique, Bruxelles, Musée d'Histoire Naturelle, Lausanne, Prof. E. Renevier, Lausanne; R. Accademia di Scienze Morale e Politiche, Naples, Ministiro di Agricoltura, Industria e Commercia, R. Comitato Geologico d'Italia, R. Accademia dei Lincei, Prof. Giuseppe Sergi, Rome; M. L. Michael-Angelo Billia, "Il Nuovo Resorgimento," Milan; R. Accademia di Scienze Morale e Politiche, Naples; Société Linnéenne, Bordeaux, Académie N. des Sciences, Arts, etc., Caen; Société N. des Sciences, Arts, etc., Cherbourg, Académie des Sciences, Arts, etc., Dijon; Union Géographique du Nord de la France, Douai; Société de Geographie, Lille; École Polytechnique, Zoölogical and Anthropological Societies, Musée Guimet, Bureau des Longitudes, Muséum d'Histoire Naturelle, "La Revue des Revues," Paris; R. Cornwall Polytechnic Society, Royal Observatory, Greenwich; Philosophi-

cal and Literary Society, Leeds; Royal Society, Linnean Society, Meteorological Council, London; Literary and Philosophical Society, Manchester; Natural History Society of Northumberland, Durham, etc., Newcastle-on-Tyne; Royal Irish Academy, Dublin; Geological and Natural History Survey of Canada, Ottawa; Canadian Institute, Toronto, Novascotian Institute of Science, Halifax; Society of Natural Sciences, Portland, Agricultural Experiment Station, Amherst, Mass.; Massachusetts Historical Society, Mr. Robert T. Swan, Boston; Messrs. Hilborne T Cresson, Andrew McFarland Davis, Cambridge, Mass.; Free Public Library, New Bedford, Mass ; Rhode Island State Agricultural Experiment Station, Providence; Connecticut Historical Society, Hartford; Yale University, American Oriental Society, New Haven, Conn ; Brooklyn Library; Prof James Hall, Albany, N. Y.; Agricultural Experiment Station, Geneva, N. Y.; American Institute of Electrical Engineers, Academy of Sciences, Council of the Scientific Alliance of New York, American Museum Natural History, Meteorological Observatory, New York; New Jersey Agricultural Experiment Station, Geological Survey of New Jersey, Trenton, Pennsylvania Geological Survey, Harrisburg, State College, Pennsylvania, Zoölogical Society, Messrs. R. Meade Bache, Amos P. Brown, A. F. Chamberlain, John Ellis, Moses Klein, Henry Phillips, Jr., Philadelphia, Agricultural Experiment Station, College Park, Md.; Peabody Institute, Baltimore, Md.; Smithsonian Institution, Philosophical Society, Geological Survey, U. S. Naval Observatory, War Department, U. S. Board of Geographical Names, Bureau of Education, Director of the Mint, U. S. Fish Commission, Washington, D. C.; Col. C. C. Jones, Jr., Augusta, Ga , Historical Society, Savannah, Ga.; Tulane University, New Orleans, La., Archæological and Historical Society, Columbus, O.; Cincinnati Observatory, University of Chicago; University of Michigan, Ann Arbor; Public Library, St. Louis, Mo.; Geological Survey of Missouri, Jefferson City; Wisconsin Academy of Sciences, Agricultural Experiment Station, Madison; State University of Iowa, Iowa

City; Editor of "Kansas University Quarterly," Lawrence; Washburn College, Agricultural Experiment Station, Topeka, Kans., Agricultural Experiment Station, Fargo, N. Dak.; Museo Michoacano, Morelia, Mexico; Bishop Crescencio Carrillo, Merida, Yucatan; Institut Egyptien, Cairo.

A paper by Prof. Daniel Kirkwood, entitled "On the Mutual Relations Between the Orbits of Certain Asteroids," was presented by the Secretary.

Pending nomination No 1242 was read.

Deferred business was laid over.

And the Society was adjourned by the President.

Stated Meeting, September 16, 1892.

Present, 5 members.

President, Mr. Fraley, in the Chair.

Correspondence was submitted as follows.

A letter from Mr. Harold Goodwin, Philadelphia, accepting membership.

New exchanges—Naturforscher Gesellschaft, Dorpat, Russia; Directeur de "La Revue des Revues," Paris, Agricultural Experiment Stations, Fargo, N. Dak., Brookings, S. Dak.

Letters of envoy were received from the Magyar Tudományos Akadémia, Budapest, Académie des Sciences, Cracow, K Geologische Landesanstalt und Bergakademie, Berlin; Vogtländische Alterthumsforschende Verein, Hohenleuben; Ministère des Travaux Publics, Paris.

Letters of acknowledgment were received from the South African Philosophical Society, Cape Town (134, 135); Capt. Richard C. Temple, Bombay, India (136); Société de Geographie de Finlande, Helsingfors (96–130, 136, 137, and Catalogue, Parts i–iv); Observatoire Physique Central, St. Petersburg (137), Prof. Japetus Steenstrup, Copenhagen (136, 137),

Naturforschende Verein, Brünn, Austria (184, 135), Dr. Francis Pulszky, Budapest (135); Naturhistorische Landes-Museum von Karnten, Klagenfurt (136); Astronomische und Meteorologische Observatorium, Triest, Austria (125–130, 136); Section für Naturkunde des Ö T. C bei K. K. Naturhistorische Hofmuseum (136), Anthropologische Gesellschaft (136), Dr. Edward Suess (137, 138), Dr Friedrich S. Krauss (Diploma), Vienna; Gesellschaft für Erdkunde, K Geologische Landesanstalt und Bergakademie, Prof F. Reuleaux, Berlin (137), Naturhistorischer Verein, Bonn (136); Schlesische Gesellschaft für Vaterländische Cultur, Breslau (136), Verein für Erdkunde, Dresden (138), Deutsche Seewarte, Hamburg (137); Naturhistorische Gesellschaft, Hanover (137), Vogtlandische Alterthumsforschende Verein, Hohenleuben (137), Gesellschaft zur Beförderung der Gesammten Naturwissenschaften, Marburg (134); Verein für Erdkunde, Metz (137); K. P. Geodatische Institut, Potsdam (137), Verein fur Vaterlandische Naturkunde in Wurtemberg, Stuttgart (135); Schweiz. Naturforschende Gesellschaft, Bern (137, 138); Prof. Carl Vogt, Geneva (137, 138); Société Vaudoise des Sciences Naturelles, Lausanne (137, 138), R. Accademia de Scienze, Lettere, etc., Padova (136); Marquis Antonio de Gregorio, Palermo (136), R. Osservatorio, Torino (136), Ministère des Travaux Publics, M. Victor Duruy, Profs. Emil Levasseur, E. Mascart, Paris (137); Mr Samuel Timmins, Arley, Coventry, Eng. (Diploma and 138); Philosophical Society, Cambridge, Eng. (Trans, xvii, 1, 2, and 138), Royal Society (Trans., xvii, 1, 2, and 138), R. Meteorological Society, Royal Institution of G. B, R. Geographical Society, Victoria Institute, Mr. C Juhlin Dannfeldt, Prof William Crookes, Sirs Joseph D Hooker, James Paget, Henry Thompson, London (138); Manchester Geographical Society (138), Natural History Society of Northumberland, Durham and New Castle on-Tyne (138), Royal Society of Edinburgh (Trans., xvii, 1, 2, and 138); Royal Observatory, Edinburgh (138), Philosophical Society, Glasgow (138); R. I. State Agricultural Experiment Station, Kingston (137, 138), Prof. J. J. Stevenson, New York (138), Prof. W. Le Conte

Stevens, Troy, N. Y. (138); Prof. E. D. Cope, Mr. H. H. Houston, Philadelphia (138); U. S. Geological Survey, Washington, D. C. (Trans., xvii, 1, 2, and 138); Leander McCormick Observatory, University of Virginia (138); "Journal of Comparative Neurology," Granville, O. (138); Dr. Robert Peter, Lexington, Ky. (138), Kansas Academy of Science (138), Washburn College (137), Topeka, Prof. Daniel Kirkwood, Riverside, Cal. (138); Bishop Crescencio Carrillo, Merida, Yucatan (138)

Accessions to the Library were announced from the Comité de Conservation des Monuments de l'Art Arabe, Cairo; New Zealand Institute, Wellington; K. K. Mineralogische Gesellschaft, St. Petersburg, K. Zoologisch. Botanische Genootschap, 's Gravenhage, Genootschap van Kunsten en Wetenschappen, Batavia; Académie des Sciences, Cracow; K. K. Militär Geographische Institut, K. K. Geologische Reichsanstalt, Vienna, K Akademie der Wissenschaften, Physiologische Gesellschaft, Berlin, Naturhistorischer Verein, Bonn; Verein für die Geschichte und Altertumskunde, Erfurt, Oberlausitzer Gesellschaft der Wissenschaften, Görlitz; Vogtlandische Alterthumsforschende Verein, Hohenleuben, Verein für Vaterlandische Naturkunde, Stuttgart, Mr. T. Cannizzaro, Messina, Italy; Ministère des Travaux Publics, Paris; Royal Society, London; University of Toronto; American Academy of Arts and Sciences, Mr. Samuel A Green, Boston, Mass.; New York Agricultural Experiment Station, Geneva; Cornell University, Ithaca, Mr. William John Potts, Camden; New Jersey Historical Society, Newark; American Academy of Political and Social Science, Rev. S. F. Hotchkin, J. F. Sachse, Miss Rebecca Elmslie, Philadelphia; Weather Bureau, Hydrographic Office, U. S. Naval Observatory, Washington, D. C.; University of California, Berkeley.

The following decease of members was announced:

John G. Whittier, born December 7, 1802; died September 7, 1892.

Prof. Joseph Lovering, Cambridge, Mass., born December 25, 1818; died January 18, 1892.

Pending nomination 1242 and new nominations 1243 and 1244 were read.

On motion, the Society

Resolved, That Dr. Charles E. Sajous be appointed a delegate to represent this Society at the Congrès des Américanistes, to be held at Huelva in October, 1892, provided that the same shall entail no expense upon this Society.

And the Society was adjourned by the President.

Stated Meeting, October 7, 1892.

Present, 16 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

A circular letter from Prof. Edward C. Pickering, Cambridge, Mass., in regard to a large southern telescope, and soliciting funds for same.

Accessions to the Library were reported from the Government Geologist, Adelaide, Australia; Académie Royale des Sciences, Amsterdam; "Flora Batava," Leiden; Mr. G. Bauer, Agram, Hungary; K. K. Naturhistorische Hofmuseum, Vienna; Mr. Albin Weisbach, Freiberg, Baden; Verein für Naturkunde, Offenbach a. M.; Société Languedocienne de Géographie, Montpellier; University Library, Cambridge, England; Radcliffe Observatory, Oxford; Natural History and Antiquarian Society, Penzance; Royal Dublin Society; Department of Agriculture, Ottawa, Canada; Agricultural Experiment Station, Bangor, Me.; Pope Manufacturing Co., Boston; Harvard University, Cambridge; Mr. Andrew McFarland Davis, Salem; American Antiquarian Society, Worcester; Dr. George Eastburn, American Meteorological Society,

Public Opinion Co, New York, Numismatic and Antiquarian Society, Mr Henry Phillips, Jr, Philadelphia.

Letters of envoy were received from the Académie des Sciences, Amsterdam; Radcliffe Observatory, Oxford, England, Zoölogical Society, London, Royal Dublin Society, Geological and Natural History Survey, Department of Agriculture, Ottawa, Canada.

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (136), Naturforsch. Gesellschaft, Dorpat, Russia (134), K Danske Vidonskabernes Selskab, Copenhagen (136), Académie Royale des Sciences, Amsterdam (135, 136), Académie des Sciences, Cracow, Austria (136); Prof. Peter Tunner, Leoben (137); K. K. Central Anstalt für Meteorologie (138), Dr Aristides Brezina, Vienna (137); Naturforschende Gesellschaft des Osterlandes, Altenburg (138); K Meteorologische Institut (137), K. Geologische Landesanstalt u Bergakademie (138), Berlin, Oberhessische Gesellschaft für Naturkunde und Heilhunde, Giessen (137), Geographische Gesellschaft, Hannover (136), K. Sachsische Gesellschaft der Wissenschaften (136), K. Sternwarte, Profs. Otto Botthngk, I. Victor Carus (137, 138), Leipzig, Verein für Erdkunde, Metz (136), Verein der Freunde der Naturgeschichte, Mecklenburg (137), Naturwissenschaftliche Verein, Osnabrück (137); R. Biblioteca N. C., Firenze, Italy (136); R Società Italiana D'Iglene, Milan (136); R. Biblioteca Universitaria, Pisa (136); R. Comitato Geologico D'Italia, Rome (137), Société de Geographie, Rédaction "Cosmos," Dr E. Hamy, Profs. Abel Hovelacque, E. Levasseur, Paris (138), University Library, Cambridge, England (138); Linnean Society, London (138), Prof. W Boyd Dawkins, Manchester, England (137, 138), Radcliffe Observatory, Oxford (134, 135, 136, 138, and Trans., xvii, 1 and 2), Tacoma Academy of Science (138), Prof. Joseph LeConte, Berkeley, Cal. (138); Prof. Robert W. Rogers, Carlisle, Pa. (138).

The Wyoming Historical and Geological Society presented a copy of "The Wyoming Memorial Medal" in white metal.

The deaths of Joseph Ernest Renan (Paris), October 2,

1892, æt. 70, and Thomas Chase (Providence, R. I.), October 6, 1892, æt. 66, were announced.

Prof. Daniel G. Brinton presented a paper entitled "Further Notes on the Betoya Dialect from Unpublished Sources."

Prof. E. D. Cope presented a paper on "The Phylogeny of the Vertebrata."

Also a paper on "Some Points in the Kinetogenesis of the Limbs of Vertebrata."

Pending nominations Nos. 1242, 1243 and 1244 were read.

The following report was presented from the Michaux Committee, and the resolution appended was, on motion, adopted:

TO THE AMERICAN PHILOSOPHICAL SOCIETY.

The Michaux Committee respectfully reports, that at a meeting of the Committee, held on September 16, 1892, a letter was received from Dr. J. T. Rothrock, enclosing the following list of the time and subjects proposed for the Fourteenth Course of lectures given under the auspices of the American Philosophical Society:

WEDNESDAY EVENINGS.

Nov.	9	Trees of Pennsylvania (Illustrated).
"	16	History and Fertility of Soil (Illustrated).
"	23	What is Economic Botany?
"	30	Plant Form Applied to Decorative Art (Illustrated).
Dec.	7.	Plant Structure Applied to Mechanical Art (Illustrated).
"	14.	How to Plant and Grow Trees.
"	21.	How to Care for Trees.

It is expected that the lectures will be delivered in the Hall of the Academy of Natural Sciences, which has been kindly tendered to him by the Academy for that purpose.

The Committee approved of the proposition and requests the Society to make an appropriation of $244 out of the income of the Michaux Fund to meet the expenses of the lectures.

The Committee submits the following resolution, which it desires shall be passed by the Society:

"*Resolved*, That the sum of two hundred and forty four dollars be appropriated out of the income of the Michaux Fund towards the expenses of the Fourteenth Course of the Michaux Forestry Lectures by Dr. J. T. Rothrock."

By order of the Committee,

J. SERGEANT PRICE, *Secretary*.

The following letter was read and the Curators were requested to report to the Society upon the request it contained:

PHILADELPHIA, May 20, 1891.

FREDERICK FRALEY, Esq.,

President of the American Philosophical Society:

Dear Sir —The Joint Special Committee appointed by the Councils of Philadelphia to secure a proper representation of historical and other exhibits from Philadelphia at the World's Columbian Exposition, to be held at Chicago, propose taking the Liberty Bell and other objects in possession of the city, and are desirous of securing additional relics. An inspection of the contents of the Hall of your Society convinced the Committee that an exhibition of the following objects in your possession would greatly add to the interest of Philadelphia's display, viz.

1. Chair in which Thomas Jefferson wrote the Declaration of Independence.
2. Chair owned and used by Benjamin Franklin
3. Electrical device invented by Franklin
4. Chair of Joseph Bonaparte from his residence at Bordentown
5. Polygraph used by Jefferson
6. Unsigned copy of the Declaration of Independence made by Jefferson, with interlineations.

And other relics of historical and antiquarian interest.

Proper attention will be given to the care and preservation of all articles exhibited under the custodianship of the Committee.

I therefore earnestly request that your Society will take into consideration the proposition to permit the above-named articles to be exhibited at Chicago under the auspices of our Committee.

Yours truly,

ELIAS P. SMITHERS, *Chairman.*

The Secretaries were authorized to reprint four pages in Prof. Cope's paper on "The Osteology of the Lacertilia," and to distribute the same with the next number of the Proceedings.

And the Society was adjourned by the President.

OCTOBER 21, 1892, having been designated by the President of the United States and by the Governor of the State of Pennsylvania as a public holiday, no meeting of the American Philosophical Society was held on that evening.

Stated Meeting, November 4, 1892

Present 14 members.

Vice-President, DR RUSCHENBERGER, in the Chair.

Correspondence was submitted as follows.

An invitation from the Naturforschende Gesellschaft des Osterlandes, Altenburg, to be present at its seventy-fifth anniversary, October 8 and 9, 1892

A circular from the University of Padua, announcing the commemoration of the four hundredth anniversary of the connection of Galileo Galilei with the University.

Letters of envoy were received from the Geological Survey of India, Calcutta; K. P. Meteorologisches Institut, K. Geologische Landesanstalt und Bergakademie, Editors of "Lateinische Litteraturdenkmaler," Berlin; Schlesische Gesellschaft für Vaterländische Cultur, Breslau; Department of the Interior, Washington D. C.; Direccion Général de Estadistica, Mexico.

Letters of acknowledgment were received from the Geological Survey of India, Calcutta (137); Dr. Otto Donner, Helsingfors, Finland (136–138); Société Imp. Mineralogique (137); Russian Chemical Society (137, 138); Central Physical Observatory (138); Imperial Academy of Sciences, St. Petersburg (138, and Trans., xvi, 1 and 2), R. Norwegian Society of Science, Throndhjem (137, 138); Société R. de Geographie, Antwerp, Belgium (125–130, 136–138); Société Hongroise de Geographie, Budapest (137, 138); Academy of Science, Cracow, Austria (137); Naturhistorisches Landesmuseum von

'Karten, Klagenfurt, Austria (187); Dr. Hermann Rollett, Baden bei Wien (186, 187); Drs. Friederich S. Krauss, M. Much, Vienna (187, 188); Anthropologische Gesellschaft, Redaction der "Naturwissenschaftlichen Wochenschrift," Berlin (188), K. Meteorologische Institut, Chemnitz (188); Naturwissenschaftliche Gesellschaft "Isis," Dresden (187, 188); Vogtlandische Altertumsforschende Verein, Hohenleuben (188); Verein der Freunde der Naturgeschichte, Mecklenburg (188); Geodatische Institut, Potsdam (188); Würtembergische Verein für Handels Geographie, Stuttgart (187), R. Instituto Lombardo di Scienze e Lettere, Milan (187), Societa Africana d'Italia, Naples (187); Marquis Antonio Di Gregorio, Palermo (187); Prof. G. Sergi, Rome (187), R. Osservatorio, Turin (187); Marquis de Nadaillac, Prof E. Mascart, Paris (188); Prof J P. Postgate, Cambridge, Eng. (187, 188); Dr Friederich Müller, Oxford, Eng. (187); Prof James Geikie, Edinburgh (188), Dr J McK. Cattell, New York (188), Oneida Historical Society, Utica (187, 188); Mr. Cadwalader Biddle, Admiral E Y. Macauley, Philadelphia (188), Smithsonian Institution (Trans., xvi, 1 and 2, and 182–186), Academy of Sciences, Chicago (187).

Accessions to the Library were reported from the Imperial Geographical Society, St. Petersburg, Société R. des Antiquaires du Nord, Copenhagen, K. K. Central-Anstalt für Meteorologie, etc, Vienna; Editors of "Naturwissenschaftliche Wochenschrift," "Lateinische Litteraturdenkmaler," Berlin; Schlesische Gesellschaft für Vaterlandische Cultur, Breslau; Physikalisch-Medicinische Societat, Erlangen, Sachsische Geschichte und Alterthumskunde, Dresden; Senckenbergische Naturforschende Gesellschaft, Frankfurt-a. M.; Verein für Thüringische Geschichte und Alterthumskunde, Jena, Verein für Lubeckische Geschichte, etc, Lübeck; Naturhistorische Gesellschaft, Nürnberg, Prof F von Sandberger, Würtzburg; Rédaction "Cosmos," Paris; Royal Society of Antiquaries, Dublin, Université, Laval, Quebec, Geological Survey, Ottawa; Bureau of Statistics of Labor, Massachusetts Historical Society, Athenæum, Boston, Harvard University, Cambridge;

Messrs. Thomas H. Dudley, William John Potts, Camden, Bureau of Statistics of New Jersey, Trenton; Academy of Natural Sciences, Editors of the "Medical and Surgical Reporter," Messrs. MacCalla & Co., Levytype Co., Messrs. John F. Lewis, Henry Phillips, Jr., Philadelphia, National Academy of Sciences, Smithsonian Institution, Census Office, War Department, Washington, D. C.; Colorado Scientific Society, Denver; Direccion Général de Estadistica, Mexico.

The decease of the following members was announced:

Dr. Pliny Earle, Northampton, Mass., May 17, 1892, æt. 83.

Sir Daniel Wilson, Toronto, August, 1892, æt 77.

James B. Francis, Lowell, Mass., September 17, 1892, æt. 78

Dr. Brinton read a paper "On the Etrusco Libyan Elements in the Song of the Arval Brethren."

Pending nominations Nos 1242, 1243 and 1244, and new nomination No. 1245 were read

The Committee on Publication reported in favor of the publication of Dr. Hilprecht's Assyrian Transcripts, which was agreed to and publication ordered in the Transactions.

Dr. Morris, on behalf of the Curators, presented a report on the portrait owned by the Society labeled Francis Hopkinson, stating that in their belief it was that of Samuel Vaughan.

Mr. Fraley gave what in his opinion were the facts of the case. On motion of Mr Fraley, the Society resolved to place the name of Samuel Vaughan on the portrait referred to.

And the Society was adjourned by the presiding member.

Stated Meeting, November 18, 1892.

Present, 11 members.

Mr. Thomas H. Dudley in the Chair.

Correspondence was submitted as follows:

An invitation from the Historical Society, Chicago, to be

present at the laying of the cornerstone of their new building, November 12, 1892.

New exchanges ordered: Naturforscher Gesellschaft, Dorpat, Russia; Université Laval, Quebec, Canada; Société d'Historie et d'Archæologie de Chalon sur-Saone, Montbéliard, France.

Letters of acknowledgment were received from the Société Imperiale Mineralogique (138, and Trans., xvii, 1, 2), Comité Géologique de la Russe (137, 138); Prof. Serge Nikitin, St. Petersburg (136, 137, 138); Musée R. d'Histoire Naturelle de Belgique, Bruxelles (135–138); K. Universitetet, Lund, Sweden (137), K. Bibliothek (137); Gesellschaft für Erdkunde, Berlin (138); Naturwissenschaftlicher Verein, Bremen (138); K. Sächsischer Altertumsverein, Dresden (137); Senckenbergische Naturforschende Gesellschaft, Frankfurt a. M. (135); Prof. E Haeckel, Jena (136, 137); Naturwissenschaftlicher Verein, Kiel (135–137); Societa Africana d'Italia, Naples (138); R. Bibliotaca Universitaria, Pisa (137); R. Accademia dei Lincei (138); Prof. G. Sergi, Rome (138), Société d'Borda, Dax (137), Société des Sciences Naturelles et Archéologiques de la Creuse, Guéret (137); Société des Antiquaires de la Morinie, St. Omer (137); Geological Society, London (137); Royal Geological Society of Ireland, Dublin (137, 138, and Trans., xvii, 1, 2); Instituto Fisico, Geografico Nacional de Costa Rica, San José de Costa Rica, A. C. (96–130, 136, 137)

Letters of envoy were received from the Faculté des Sciences, Marseille, Musée Guimet, Société Philologique, Paris; Royal Statistical Society, London; Department of the Interior, Washington, D. C

Accessions to the Library were reported from the Asiatic Society of Japan, Yokohama; Verein für Kunst und Alterthum in Oberschwaben, Dr. Reinold Kapff, Ulm, Wurtemberg; Société des Antiquaires de Picardie, Amiens, France, Société des Sciences Physiques et Naturelles, Commission Météorologique de la Gironde, Bordeaux; Faculté des Sciences de Marseille; Société d'Histoire et d'Archéologie de Chalon-sur-Saone, Montbéliard; Société d'Anthropologie, Société

Philologique, Musée Guimet, Paris; Société des Antiquaires de la Morinie, St. Omer; Editors of the "Yale Review," Boston; Royal Society of Canada, Montreal; Dr. Daniel G. Brinton, Mr. Henry Phillips, Jr., Philadelphia; Miss R. C. Longstreth, Sharon Hill; Hydrographic Office, Department of the Interior, Washington, D. C.

Photographs of Dr. John J. Stevenson, New York, and Mr. M. Fisher Longstreth, Sharon Hill, Pa., were received for the Album.

Dr. W. P. Wilson presented for the Transactions a paper by James Ellis Humphrey on "The Saprolegniaceæ of the United States, with Notes on Other Species." On motion the paper was referred to a Committee of three members of the Society, to be appointed by the President at his leisure.*

The Secretaries presented a "Kwakiutl Vocabulary," by Dr. Franz Boas (of Worcester, Mass.).

Mr. Lorin Blodgett exhibited a cosmical map of the Northern Hemisphere, and made some remarks thereon.

Dr. Cope read a paper on "A False Elbow in a Horse."

Pending nominations Nos. 1242, 1243, 1244, and new nominations Nos. 1245, 1246, 1247 and 1248 were read.

Dr. Morris as Curator placed before the Society some of the interesting articles found by him in the museum, such as the theodolite belonging to the Proprietor's family, used in laying out the lots of Philadelphia, and on Mason and Dixon's line, presented by Dr Physick; the model of a mowing machine presented in 1771; of a fire escape, by Rev. Dr Collin, in 1791; of a bathometer deposited by Jefferson in 1806, of a torpedo-boat, by Fulton, in 1815, etc.

Dr. Morris suggested the following heads as useful for classifying the cabinets, at least temporarily, viz.:

Objects illustrating American antiquities, such as the Peale collection, the Poinsett collection, and many Indian relics.

Objects illustrating progress of science and art, and the history of thought in other countries.

* The President subsequently appointed as said Committee, Dr. Rothrock and Messrs. Meehan and Martindale.

Objects illustrating mechanical arts and appliances, for agriculture, commerce, navigation, etc.

Geological, mineralogical and botanical specimens—in the latter class are many of great value, including Muhlenberg's Herbarium.

Scientific instruments, and instruments of precision—some of them rare and possessing great historical value.

Miscellaneous objects of interest to the student of the progress of human thought and civilization

On motion the Curators were authorized to have framed for display a series of plaster medallions

And the Society was adjourned by the presiding member.

Stated Meeting, December 2, 1892.

Present, 18 members.

President, Mr FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters of envoy were received from the K Sächsische Gesellschaft der Wissenschaften, Leipzig; Zoölogical Society of London, Hon. Henry C. Baird, Philadelphia

Letters of acknowledgment were received from the Royal Society of Victoria, Melbourne (138); Prof. Japetus Steenstrup, Copenhagen (138), K. Zoologisch. Botanische Genootschap, 'S Gravenhage, The Hague (138); Kolonial Museum (137, 138), Fondation de P Teyler van der Hulst, Harlem (137, 138, and Trans., xvii, 1, 2); Akademija Umiejetności, Krakau, Galicia (138); Prof. Peter von Tunner, Leoben, Styria (138), Dr. Aristides Brezina, Vienna (138), Deutsche Geologische Gesellschaft, Berlin (138).

Accessions to the library were reported from the Geological Survey of India, Calcutta; Société Finno Ougrienne, Helsingfors; Naturforscher-Verein, Riga; K D. Videnskabernes Selskab, Copenhagen; Naturforschende Gesellschaft, Emden; Dr. James Henry's Trustees, Dublin, Ireland; Société de

l' Histoire de France, Marquis de Nadaillac, Prof. Paul Topinard, Paris; Victoria Institute, London, University of the State of New York, Albany; Mr. Mark V. Slingerland, Ithaca; Mr. Henry Phillips, Jr., Philadelphia; Bureau of Education, Prof. Cleveland Abbe, Washington, D. C.; Observatorio Astronómico Nacional de Tacubaya, Mexico; Société Scientifique du Chili, Santiago.

The Committee on Dr. J E. Humphrey's paper was continued.

The report of the Treasurer was read and referred to the Finance Committee.

The report of the Publication Committee for the year was made.

The report of the Library Committee was approved.

On motion, Prof. Cope was permitted to withdraw the paper presented by him at the last meeting, and to substitute therefor one on "False Elbow Joints."

Pending nominations Nos. 1142 to 1248, and new nominations Nos. 1249 and 1250 were read.

And the Society was adjourned by the President.

Stated Meeting, December 16, 1892.

Present, 18 members.

President, Mr FRALEY, in the Chair.

Correspondence was submitted as follows:

A letter from the K. K Geographische Gesellschaft, Vienna, discontinuing exchanges with the Society, as it has determined in future only to exchange with Geographical Societies.

A circular from the Comité G. A. Hirn, Colmar, Alsace, soliciting subscriptions for the completion of the monument to be erected to Prof. G. A. Hirn.

A letter from Mr. Harold Goodwin, Philadelphia, a new member, apologizing for not having previously taken his seat.

Letters of envoy were received from Mr. Henry Carey Baird, Philadelphia; Library of Oberlin College, Oberlin, O.; Texas Academy of Science, Austin.

Letters of acknowledgment were received from the Institut Egyptien, Cairo (136, 137), Prof. Francis Pulszky, Budapest, Hungary (184, 186–188); University of Bonn (188); Naturforschende Gesellschaft, Freiburg i B. (188); Dr Albin Weisbach, Freiberg, Saxony (187), Prof. Dr. Doederbeen, Strassburg, Alsace (185–188); I. R. Accademia Degli Agiate Rovereto, Tyrol (187); Société Geologique de France, Paris (187, 188)

Accessions to the Library were reported from the Physikalisch-Œkonomische Gesellschaft, Konigsberg; Nassauische Verein für Naturkunde, Weisbaden; Società Africana D'Italia, Naples, Naturforschende Gesellschaft, Zurich; Instituto y Observatorio de Marina, San Fernando; Royal Astronomical Society, London; Hon. R. C. Winthrop, Astronomical Observatory of Harvard College, Cambridge, Mass; Geological Society of America, Rochester, N. Y.; Dr Charles A. Oliver, Messrs. Abraham Jordan, Henry Phillips, Philadelphia, U. S. Coast and Geodetic Survey, Bureau of Education, Washington, D. C., Oberlin College, Texas Academy of Science, Austin, Free Public Library, San Francisco, Cal.

The Committee upon Dr. Humphrey's paper for the Transactions reported it worthy of publication, which was so ordered and the Committee discharged.

This being the regular evening for the election of members, pending nominations Nos. 1242 to 1248 were read, spoken to and balloted for.

New nominations Nos. 1249, 1250 and 1251 were read.

The death of Dr. John S. Newberry, December 7, 1892, æt. 70, was reported.

The report of the Finance Committee was presented and the appropriations for the ensuing year were passed.

The Curators presented the following report:

CURATORS' REPORT UPON THE SOCIETY'S RESOLUTION OF MAY.

1. The Curators respectfully state that the cataloging and labelling of the Poinsett and Keating collection beyond that which has been already done is impracticable under present conditions. And we would suggest that such a proposition as that involved in the Society's resolution is a matter demanding the consideration and personal supervision of a specialist in American archæology.

2. Before it is possible to determine where the collection will best serve the purposes of ethnological study, the Curators believe that this Society should have an official declaration from the Academy of Natural Sciences: First, as to its desire to retain it. Secondly, as to the manner of display which the Academy would guarantee for it, and any conditions which the Academy would propose to put upon the retention of the aforesaid collection as a loan from this Society.

PATTERSON DU BOIS, *Chairman.*
J CHESTON MORRIS,
(as to Section 1 only)
R MEADE BACHE

Dr. Morris from the Curators presented a minority report as to the second section of their communication as follows, viz.:

Whereas, The Museum of the Society is now in a fireproof building, and has space where the Keating and Poinsett collections can be well displayed for purposes of study, and the reasons for its deposit in the care of the Academy of Natural Sciences no longer exist, therefore, be it

Resolved, That the Academy of Natural Sciences be requested to return these collections in accordance with the terms of deposit.

J. CHESTON MORRIS, M D.,
one of the Curators.

Dr. Morris moved that the Academy of Natural Sciences be requested to return the said Poinsett, etc., collection.

Mr. Williams moved, as an amendment, that the majority report be adopted.

After a discussion the amendment was adopted and the majority report was agreed to.

The request of Dr. Elliott Coues for the withdrawal of the Lewis and Clark Note-books, accompanied by proper vouchers, was read.

Dr. Morris moved that the subject be referred to the Library Committee with power to act.

Mr. Price offered the following substitute, which was accepted by Dr. Morris and adopted by the Society.

Dr. Coues, a member of the Society from Washington, having presented a request to the Society that the Lewis and Clark papers deposited with the Society, on April 8, 1818, under a receipt of that date be loaned to him for the purpose of preparing a new edition of the travels of those gentlemen, it was on motion of Mr. Price:

Resolved, That the Librarian be authorized to lend to Dr. Coues all the papers now in our possession deposited by Lewis and Clark in the year 1818, as per said receipt, he taking from the doctor his obligation (with a sufficient penalty) to take care of them, keep them when not in his library in some safe deposit vault at Washington, and return them at the expiration of three months unless further time shall be given to him to retain them.

Mr. Williams offered the following resolution, which after discussion was adopted:

Resolved, That the Curators of the Society be requested to report upon the cost of placing the Poinsett and Keating collection in this Museum and caring for it, and upon other collections or institutions in this city, if any, with which this collection could be deposited with advantage to the cause of science and the study of this collection, and upon some plan for arranging the collections of the Society in its Museum in accordance with the wishes, if any, of the donors of different collections.

The result of the balloting for members was reported to the President, who declared the following named to have been duly elected members of the Society.

2205. Mr. Charles H. Cramp, Philadelphia.
2206. Prof. Samuel G. Dixon, M.D., Philadelphia.
2207. Prof. John M. Macfarlane, D. Sc., Lansdowne, Phila.
2208. Prof. Francis X. Dercum, M.D., Philadelphia.
2209. Prof. James Ellis Humphrey, D. Sc., Amherst, Mass.

And the Society was adjourned by the President.

The Etrusco-Libyan Elements in the Song of the Arval Brethren.

By D. G. Brinton, M.D., LL D

(Read before the American Philosophical Society, November 4, 1892.)

In two communications to the American Philosophical Society, published respectively in 1889 and 1890, I offered a series of considerations which led me to believe that there existed an affinity, or ethnic relationship, between the ancient Etruscans and the Libyans, or Berber tribes, of North Africa.* In the present paper I would supplement what I there said by a brief study of the Etrusco-Libyan elements in one of the oldest literary monuments of Roman antiquity—the Song of the Arval Brethren.

These *Fratres Arvales* were a priestly sodality, which, according to tradition, dated back to the foundation of Rome, Romulus himself having been one of the twelve members of which the sacred college was composed. Their function was to perform certain acts of worship at a festival in the month of May in honor of "the divine goddess" *Dea Dia*, whose proper name is nowhere mentioned. The object of the festival was propitiatory to the divinities of agriculture, that the fields might yield bounteous harvests; whence the brotherhood derived its name—*ut ferunt fruges arva*. The rites consisted of sacrifices, processions, and, at a certain stage of the proceedings, of the repetition of a very ancient song, the words of which, as being too archaic for the members, were in the time of the Empire written down in small books, which the Brethren held in their hands as they chanted

Although classical authors scarcely mention the Arval Brethren, we have very minute accounts of their rites, for it was their laudable custom at the close of each annual festival to inscribe the fact of the celebration with its date and some other particulars on a slab of stone. Nearly one hundred of these memorials have been discovered from time to time, and on one of the tablets, exhumed in 1778, recording the annual festival in May, A.D. 218, the Brethren had the happy idea to cause the song itself to be inscribed. They apparently gave the "copy" to the local stonecutter, and did not stay to read the proof, for he has made several palpable blunders, such as spelling the same word differently in different

* "The Ethnologic Affinities of the Ancient Etruscans," *Proc. Amer. Phil. Soc.*, Vol. xxvi; "On Etruscan and Libyan Names," *ibid.*, Vol. xxviii.

lines; but, as each line is repeated three times, we have a strong check on his vagaries. All critics agree, however, as to its value as a monument of antiquity, and one of its most recent editors does not go too far when he calls it "by far the most venerable specimen of Latin which we possess."*

Its interpretation has tasked the ingenuity of the learned; but, before I proceed to that, I will recall some facts about the origin of this priestly sodality It was distinctly and wholly Etruscan, and was traditionally connected with the woman, Acca Larentia, and her Etruscan husband, Tarrutius. There are many stories told about Acca, and there are, according to some, a false and a true Acca; but those well acquainted with the kaleidoscope of mythology will find no difficulty in reconciling the beautiful and notorious Acca who was chosen, along with a plenteous board and a skin of old wine, to make merry the night with Hercules; the lascivious Acca, whom shepherds called *Lupa*, for she was as "salt as wolves in pride," with the Acca who ruled the Lares, guardian spirits of the virtuous household, as her by-name *Larentia* indicates. As for her forename, *Acca*, *Aχca*, it occurs in Etruscan inscriptions, though its form has been doubted by some good scholars.

The story—or one of the stories, and the most consistent—ran that Hercules, after his joyous rendezvous, gave her the extremely sane and modern advice to marry the first rich man she could capture. This proved to be the worthy Tarrutius, by whom she achieved the noble maternity of twelve sons, all of whom grew to manhood, and the position in the envied fraternity of the first who died was promptly taken by Romulus, who had already made a name for himself by plowing his furrow around the Palatine Hill, and declaring himself master of the situation. Acca survived her husband, inherited all his property, as the Etruscan custom was, and left it all by will to the Roman people, while her sons, along with Romulus, constituted themselves a holy brotherhood, pledged to call upon the ancient gods of their mother's religion once every year, in the springtime, to bless the fields, and send plenteous returns for the farmer's toil.

Such were the Arval Brethren; and in the pleasant Maytime of each year they met and fared forth from Rome along the Via Campana for five miles, when they reached the grove and temple

* F. D. Allen, *Remnants of Early Latin*, p. 66.

of the Dea Dia. There they spent three days—a charming escapade, no doubt, from city life—slaughtering a white heifer, also some specially fed young pigs, *porcilias piaculares*, and not forgotten by neighboring farmers with delicate spring vegetables, as we may gather from the records. Then came the antique song and solemn dance in the temple of the Goddess, the Brethren clad in quaint traditional garb, and crowned with wreaths of leaves and early wheat.

We may well suppose that with this history and these customs we should look among the Arval Brethren for true folklore, for the preservation of some of the ancient names and ideas of the Etruscan religion, in a day when they had quite passed out of the ken of the current worship and mythology of Rome. The place to look for it, of course, is in their Song, and I think we find it there with a plainness that cannot be mistaken, and yet which none of the commentators and critics has heretofore brought out, or even referred to.

The accurate text of that Song is subjoined. In giving it, I choose, in cases of discrepancy, where the majority of the sculptor's readings—that is, two out of three—are the same.

THE SONG

ENOS LASES IVVATE
ENOS LASES IVVATE
ENOS LASES IVVATE

NEVE LVERVE MARMAR SINS INCVRRERE IN PLEORES
NEVE LVERVE MARMAR SINS INCVRRERE IN PLEORES
NEVE LVERVE MARMAR SINS INCVRRERE IN PLEORES

SATVR FVFERE MARS LIMEN SALI STA BERBER
SATVR FVFERE MARS LIMEN SALI STA BERBER
SATVR FVFERE MARS LIMEN SALI STA BERBER

SEMVNIS ALTERNEI ADVOCAPIT CONOTOS
SEMVNIS ALTERNEI ADVOCAPIT CONCTOS
SEMVNIS ALTERNEI ADVOCAPIT CONOTOS

ENOS MARMOR IVVATO
ENOS MARMOR IVVATO
ENOS MARMOR IVVATO

TRIVMPE TRIVMPE TRIVMPE TRIVMPE TRIVMPE

The translation of the first line offers no particular difficulty, as the initial *R* is prothetic and strengthening, and there are plenty of examples where *s* is preserved between two vowels for later *r*. Nor about line second is their serious controversy. The compound *luerve* may fairly be *luem ruem* (*ruinam*), and we may render:

"Help us, O Lares,
And, O Marmar, let not blight nor ruin fall upon the flowers."

Or, perhaps, instead of *pleores* = *flores*, we may take it *pleores* = *plures*, and translate "upon the multitude," though this has less pertinence.

But the third line is where the commentators have broken down. The latest authority within my reach, Prof. Allen, of Yale College, gives it up as hopeless, and leaves it untranslated. Mommsen proposes that it shall be split in two, one half an appeal to the gods, *Satur esto, fere mars!* "Be satiate, fierce Mars," and the other half to the individual brethren, *In limen insili! Sta! Verbera* (limen)!

This is terribly strained. Mars was not a fierce deity, nor god of war to the Etruscan, but of peace, of agriculture, and of the springtime. He was guardian of the husbandman, not of the warrior. The word *Berber* is repeated three times, without any variation, and is plainly a reduplicated proper name, like *Marmar* in the previous line, to which it bears a distinct rhythmical relation. The stonecutter would not have made the same error three times over in such a common word as *verbera*, if that had been his copy. For these reasons, and others which he himself advances, and which, being of a purely scholastic character, I need not quote, the distinguished linguist of the Collège de France, Prof. Michel Bréal, proposes the reading:

"Satu tutere, Mars; clemens satis esto, Berber."

He is convinced that we must accept the last word as *Berber*, but as to its significance he is at a loss, and suggests that it may be "une variante de Marmar."

This suggestion has not been admitted even by those who accept his reading. They have presented various guesses; none near the mark, if we may judge by their reception.* But suppose, along

* See Ch. Schmbel, in *Actes de la Société Philologique*, Tome xiv, p. 200 sq.

with Lases, Marmar and Mars, it is a more or less Latinized form of a pure Etruscan word, what could we make of it?

The first difficulty is that the Etruscan probably had no *b*, in which they resembled many of the modern Berber dialects, where it is also lacking. There was some intermediate labial in Etruscan which the Romans rendered by either *f*, or *v*, or *b*. Probably it was close to the Greek digamma, *F*. Did the Etruscans have a god *Fer*, or *Ver*? Undoubtedly. That was the exact name of the deity whom Varro calls *Deus Etruriæ princeps*, "chief of all the gods of Etruria." The Latin writers give his full name as Vertumnus; but that the last two syllables do not belong to the name, but constitute an appellative suffix, the analogy of the Etruscan words *Vol-tumna*, *Laχumna*, and many others, has long since convinced Etruscologists.*

The functions of this god *F*er were most appropriate to the rites of the Arval Brethren. The gardens of the spring, the harvests of the summer, but especially the maturing grain and fruit of the autumn, were his special care. Thus he came to be a chief god, one who looked after home life and works. He was the culture-hero of the Etruscans, analogous to such figures as Michabo and Viracocha in native American mythology

But here a striking identity meets us. Among the Libyans of Northern Africa this same divinity, with the same attributes and the same name, appears to meet us. Their chief god was also *Ber* (*Fer*, *Ver*); he was their protector and mythical ancestor; from him they claimed their name, *Berbers*, *Brebres*, etc., and to this day the secluded tribes of the Sahara point to sacred spots where their famed progenitor and teacher was buried †

It would be an easy error to suppose that *Ver* was the Latin word for spring from the Greek, and that in the Pantheon *Ver* was the personation of the season of spring, but this was not the case. The *Vertumnalia* were in the fall of the year, in the month of October, and were never supposed to have reference to any such

* See Deecke, note to Müller, *Die Etrusker*, Bd. ii, s. 51 *et al.* In some of the Latin geographers the name Berenice, that of a Libyan city, is spelled Verenice (Borsari, *Geografia della Tripolitana*, p. 181).

† "L'ancêtre commun de toutes les tribus berbères," Duveyrier, *Les Touaregs du Nord.* He is the *Jarbas* of Greek legend, son of Jupiter Ammon and a Libyan nymph, and king of the Getuli, to escape whose pressing solicitations Queen Dido plunged the sword into her own bosom. His immediate descendants are still referred to by the Touaregs as the *Jabbaren*.

impersonation. This fact brings out the antithesis in the line between the two divinities named Marmar was the god of the early season and of the spring crops, Berber or Ver of the autumn and the late crops, and this was the reason for bringing them together in this adjuration for the fertility of the fields.

The meaning of Ber in the ancient Libyan language I have partly discussed elsewhere. It is from the biliteral root B R, the primitive meaning of which was "to overflow," or something equivalent to that idea. Applied to population, it was "to migrate," "to journey forth," and, as only freemen could have that privilege, it came to mean "to be free," and it was apparently in that proud significance in which it was adopted a patronymic. In its earlier sense it was and is applied to water which boils over, and in a neuter form it signifies "to be in excess," "to be abundant," and hence "to abound in," "to be fruitful in" (*foissoner*) Here we see where the meaning of *Ver* comes in, as the god of the harvest, of the fruitage and the vintage.

In the ancient Numidian epigraphy we find this name repeatedly inscribed on tombstones, usually with a similar suffix, *Vermim*, *Vermimo*, *Vermima*,* in which we easily see the biliteral Berber radical M M, from which are derived the terms for both mother *Imma*, and son *Emmi*. Whether the termination *-umnus*, so common in Etruscan names, and occasionally written *ummus* (*lucumno*, *lucummo*), is not this same termination may be suggested, in which case *Vertumnus* would mean "Son of Ber" And, in this connection, I must not omit to mention that precisely the reduplicated form *Marmar* is found on Numidian inscriptions two or three centuries before our era.†

Passing to the fourth line of the Song, its first word seems a stumbling block Some think *semones* is an abbreviation of *semihomines*, and means "demi-gods," others would derive it from *sero*, *semen*, and take it to refer to gods of sowing, and hence agricultural; while Mommsen understands it as *se-homines*, "apart from men," applied to divinities in general. Most authorities suppose *advocapit* to be a mistake for *advocabite*, and the translation

* See Halévy, *Essai d'Epigraphie Libyque*, Inscriptions 7, 22, 23, 24, and others. The termination *mim* occurs in other inscriptions, as No. 47, *Uba-mim*; No. 152, *Ar-mima*, etc.

† As in Halévy's collection, No. 100, etc. The Libyan general conquered by Pharaoh Merenptah was named Marmaris, "Son of Marmar." The radical M R, in the Berber dialects, means "to be great" and "to be old," the ideas of age and power being in them, as in so many tongues, synonymous.

of the line is given, "Call ye, in turns, on all the Semones." I should prefer to consider that *semones* refers distinctively to the two gods named *Marmar* and *Berber*, and that *advocapit* is an abbreviated form of the passive future, used impersonally, while *conctas* should have its original meaning, not "all," but "conjoined," "united," referring solely to the two divinities who are appealed to in the Song. It should then be rendered, "To these united gods of the crops (*i. e.*, the one of the early, the other of the later, season) praise shall be rendered"

The last lines offer no particular difficulties, so I offer this free paraphrase of the whole Song

THE SONG OF THE ARVAL BRETHREN.

Come to our aid, O Lares !
O Marmar ! Let nor blight nor rain fall upon the flowers
The sown seeds, O Marmar ! protect, and favor the product, O Berber !
Praise shall be paid in turn to these associated gods of the crops.
Come to our aid, O Marmar !
Shout for joy ! shout for joy ! shout for joy !

The similarities which I here point out have an additional interest in the light of some recent discoveries in Egyptian archæology.

It has been generally accepted that the Tur-sha, who, about the close of the thirteenth century B.C., invaded Egypt from the West along with the Libyans, were Etruscans; but only recently has it been shown by conclusive evidence that the Etruscans continued to live in the Western Fayoom and on the Libyan boundary of Egypt for many centuries afterwards. One part of this evidence is from Egyptian inscriptions. At Medinet Gurob, close to the Libyan boundary, Mr. Flinders Petrie exhumed the coffin of a man bearing the inscription *An-en-Tur-sha*, "A man of the Tur-sha," showing that prominent citizens of Egypt (the coffin was that of a wealthy person) were at that time recognized as of the *Tur-sha* blood

Still more extraordinary was the discovery of an Etruscan Ritual Book in this portion of Egypt, the celebrated Agram Codex, which has lately been published by Prof Krall, of Vienna. He considers it conclusive as to the existence of an Etruscan settlement in this part of the Egyptian dominions.*

* *Die Etruskischen Mumienbinden des Agramer National-Museums*, ss. 18, 19 (Wien, 1892). He quotes and discusses Petrie's researches at Medinet Gurob.

Such facts lead us to inquire particularly as to what we know from the oldest authors concerning the population of the territory immediately west of lower Egypt. On turning to the best and oldest authority, Herodotus, who obtained his information from members of the Greek colony at Cyrene, I was surprised to find that he locates precisely in the region referred to a tribe whose name, as he gives it, is evidently that of the Tur-sha—to wit, the *Adurmachides*.* It is possible that *machides* is a Cyrenaic Greek termination, meaning "warriors," at any rate we have the stem *Adur* or *Atur*, which is precisely what recurs in *Etruria*. It is undoubtedly a Libyan word, from the root D R or D R'R, whence the words for mountain, *adar* or *adrar*. The *Tur-sha* were, therefore, the mountaineers, those dwelling in the range of mountains which rise to form the eastern Libyan plateau. The analogy between *adar* and *adrar* on the one hand, and *adur* and *etrur*, on the other, is very noticeable. As the Italian Etruscans made little use of the letter *d*, substituting for it the *t*, we have the very common Tuscan radical *tur* or *tar*, as in the name of the field which the mother of the Arval Brethren on dying left to Romulus, the *ager turax* or *tarux*.†

* He assigns their position as "from the borders of Egypt to Port Plynos," and distinguishes them from the Ammonii of the Oasis of Jupiter Ammon, the modern El Siwah (*Hist.*, Book iv, cap 168). The latter to this day speak a well-marked Berber dialect, as is proved by the short vocabulary collected by Bayle St. John.

† Both orthographies are sanctioned by Müller, *Die Etrusker*, Bd. ii, s. 107

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Stated Meetings Held

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LIST OF SURVIVING MEMBERS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA

FOR

PROMOTING USEFUL KNOWLEDGE.

Corrected to January 6, 1893,

BY

HENRY PHILLIPS, JR.,

A Secretary of the Society.

List of surviving Members of the American Philosophical Society, held at Philadelphia for Promoting Useful Knowledge.

The addresses here given so far as known are at the present time. Corrections of this list are respectfully solicited.

A name printed in *italics* indicates that the Society is uncertain as to whether such member is still living and desires information on the subject

The Society will be happy to receive *photographs* (cabinet size preferred) of such of its members as have not already sent

A.

	Name.	*Date of Election.*	*Present Address*
1687.	ABBE, CLEVELAND	July 21, 1871,	Army Weather Bureau, Washington, D. C.
2170.	ABBOTT, CHARLES C.	Dec. 20, 1889	Bristol, Pa.
1462.	ABBOT, HENRY L.	April 18, 1862,	New York city, N Y
1809	ÅCKERMAN, RICHARD	July 21, 1878,	Stockholm, Sweden.
1719.	ACLAND, HENRY W.	Jan'y 17, 1873,	Oxford, England.
2198.	ADAM, LUCIEN	Dec. 17, 1888,	Rennes, France.
2201.	ADAMS, H. B.	May 21, 1886,	Baltimore, Md
1371.	*Adamson, Rev. John C.*	July 18, 1856.	
1779.	AGASSIZ, ALEXANDER	April 16, 1876,	Cambridge, Mass.
1642.	AGASSIZ, ELIZABETH.	Oct. 15, 1869,	" "
2061.	ALBRECHT, PAUL	May 21, 1886,	Hamburg, Germany
1806.	ALISON, ROBERT H.	May 3, 1878,	Ardmore, Pa.
1859.	ALLEN, JOEL ASAPH	Sept. 20, 1878,	New York, N Y
1778.	ALLISON, JOSEPH	April 16, 1875,	Philadelphia
1927.	AMES, CHARLES G.	Jan'y 21, 1881,	Boston, Mass.
2054.	ANDERSON, GEORGE B.	Feb'y 19, 1886,	West Point, N Y
1855.	ANDERSON, GEORGE W	Oct. 14, 1880,	Rosemont, Pa.
2164.	ANGELL, JAMES B.	Oct. 18, 1889,	Ann Arbor, Mich
1102.	*Angelis, Pedro de.*	Jan'y 17, 1840,	*Buenos Ayres, S A*
2103.	ARGYLL, DUKE OF.	May 21, 1886,	London, England
1761.	ARMSTRONG, WM. GEORGE	July 17, 1874,	Newcastle-on-Tyne, England
1395.	ASHHURST, JOHN	Jan'y 15, 1864,	Philadelphia.
2212.	ASHHURST, RICHARD L.	April 15, 1894,	"

B

Name.	*Date of Election.*	*Present Address.*
1985. Bache, R. Meade	Jan'y 18, 1884,	Philadelphia.
1683. Bache, Thomas Hewson .	Feb'y 2, 1877,	"
1650. Baird, Henry Carey . .	Jan'y 15, 1869,	"
1961. Baird, Henry M. . . .	Jan'y 18, 1884,	Yonkers, N Y
2078. Baker, William S. . .	May 21, 1886,	Philadelphia.
2191. Ball, Robert	May 15, 1891,	Dublin, Ireland
1904. Barber, Edwin Atlee . .	April 15, 1881,	West Chester, Pa.
1818. Barcena, Mariano	Feb'y 2, 1877,	Mexico.
1741. Barker, George F . . .	April 18, 1873,	Philadelphia
2011 Barker, Wharton	April 18, 1884,	"
2144. Barnard, William T	May 20, 1887,	Boonton, N J
1902. Bartholow, Roberts	April 16, 1880,	Philadelphia.
1182. Bartlett, W H. C	April 17, 1840,	Yonkers, N Y
2118. Bastian, Adolph . .	Dec. 17, 1886,	Berlin, Germany
1983. Bell, Alexander Graham .	July 21, 1882,	Washington.
1968. Bell, Joseph Snowden . . .	July 21, 1882,	Philadelphia.
1822. Bell, Lowthian . .	April 21, 1876,	Newcastle-on Tyne, England
2142. Biddle, Alexander	Feb'y 17, 1888,	Philadelphia.
2184. Biddle, Arthur	Dec. 21, 1888,	"
1920. Biddle, Cadwalader .	Oct 15, 1880,	"
1831. Biddle, Craig . . .	Feb'y 2, 1877,	"
2134. Billings, John S. .	Feb'y 18, 1887,	Washington, D C
2157. Blair, Andrew A. .	May 17, *1889,	Philadelphia.
1554. Blair, Thomas S. .	Jan'y 19, 1866,	*Pittsburgh, Pa*
1669. Blake, William Phipps .	Oct. 21, 1870,	New Haven, Conn.
1796 Blasius, William	Oct. 15, 1875,	Philadelphia.
1722. Blodget, Lorin . .	April 19, 1872,	"
1444. Böhtlingk, Otto . .	Jan'y 17, 1862,	Leipzig, Germany
2047 Bonwill, W G. A . . .	Oct 16, 1885,	Philadelphia.
1128. Boyé, Martin H. . . .	Jan'y 17, 1840,	Coopersburg, Pa.
1826. Brackett, Cyrus Fogg .	Feb'y 2, 1877,	Princeton, N J.
2082. Branner, John C . . .	May 21, 1886,	Palo Alto, Cal
2106. Brezina, Aristides	May 21, 1886,	Vienna, Austria
1626. Brinton, Daniel G	April 16, 1869,	Philadelphia.
2092. Brinton, John H. . . .	Feb'y 19, 1886,	"
1763. Britton, J Blodgett .	Oct. 17, 1873,	"
2092. Brooks, William Keith . . .	May 21, 1886,	Baltimore, Md
1881. Brown, Arthur Erwin . .	April 18, 1879,	Philadelphia
1828. Brown-Séquard, E. .	Jan'y 20, 1854,	Paris, France.
1614. Brugsch, Henri	Jan'y 15, 1869,	Berlin, Prussia.
1547. Brush, George J. . .	Jan'y 20, 1865,	New Haven, Conn
1638. Bullock, Charles . .	Oct 15, 1869,	Philadelphia.
1462. Bunsen, Robert W. . .	Jan'y 17, 1862,	Heidelberg, Germany
1992. Burk, Isaac	Jan'y 18, 1884,	Philadelphia
2007. Burk, Jesse Y	Jan'y 18, 1884,	"
1908. Butler, William	April 15, 1881,	West Chester, Pa.

C

1758. Campbell, John Lyle .	July 18, 1873,	Crawfordsville, Ind
1606. Canby, William Marriott .	Oct. 16, 1868,	Wilmington, Del
2051. Cannizzaro, Tommaso	Oct. 16, 1885,	Messina, Italy
1751. Capellini, Giovanni	April 18, 1873,	Bologna, Italy
1798. Carll, J. F.	Oct 15, 1875,	Pleasantville, Pa.
2128. Carrillo, Crescencio	Dec. 17, 1886,	Merida, Yucatan.

Name.	Date of Election.	Present Address.
1911. Carson, Hampton L.	April 18, 18[illegible],	Philadelphia.
1767 Cassatt, Alexander Johnston	Oct. 18, 1872,	"
2147. Castner, Samuel, Jr.	Dec. 16, 1887,	"
2158. Cattell, J McKeen	May 18, 1888,	New York, N Y.
1676. Cattell, William C. . . .	Jan'y 20, 1871,	Philadelphia.
1908. Chance, Henry Martyn .	April 16, 1880,	"
1768. Chandler, C. F	April 16, 1875,	New York, N Y
1778. Chapman, Henry C.	April 16, 1875,	Philadelphia.
2121. Charencey, Comte Hyacinthe de	Dec. 17, 1886,	St. Maurice les Charencey, France.
2111. Childs, George W	Dec. 17, 1886,	Philadelphia.
2158. Clark, Clarence H. . .	May 17, 1889,	"
1717. Clarke, Thomas C.	Jan'y 17, 1873,	New York, N Y
19[illegible]. Claypole, E. W	Jan'y 18, 18[illegible],	Akron, Ohio.
2046. Cleemann, T M.	Oct. 16, 18[illegible],	Philadelphia.
1876. Cloizeaux, des, A	Oct. 18, 1878,	Paris, France.
19[illegible]. Cohen, J Solis . .	Jan'y 18, 1884,	Philadelphia.
20[illegible]. Coleridge, Lord	Jan'y 18, 1884,	London England.
1658. Cope, Edward D.	Jan'y 19, 1866,	Philadelphia.
1667 Coppée, Henry . .	Jan'y 18, 1856,	Bethlehem, Pa.
2150. Cora, Guido	Dec. 17, 1886,	Turin, Italy
1474. Cornelius, Robert	Oct. 17, 1862,	Philadelphia.
1867 Coues, Elliott	Sept. 20, 1878,	Washington, D. C.
1682. Cox, J. D	April 18, 1879,	Cincinnati, O.
1672. Coxe, Eckley B . .	Oct. 21, 1870,	Drifton, Pa
2087 Charles H. Cramp . .	Dec. 16, 1882,	Philadelphia.
1864. Crane, Thomas F	Feb'y 2, 1877,	Ithaca, N Y
1592. Cresson, Charles M. .	April 17, 1867,	Philadelphia.
2100 Crookes, William .	May 21, 1886,	London, England.
2172. Cruz, Fernando (of Guatemala)	Dec. 20, 1889.	
1459. Curwen, John	April 18, 1861,	Warren, Pa.

D

Name.	Date of Election.	Present Address.
1567 Da Costa, J M.	Oct. 19, 1866,	Philadelphia.
1384. Dana, James D . .	July 21, 1854,	New Haven, Conn.
1806. Dannfelt, C. Juhlin . .	April 21, 1876,	Stockholm, Sweden
1518. Daubrée, A.	July 17, 1863,	Paris, France
1811. Davenport, Samuel .	Oct. 20, 1876,	Adelaide, S. Australia.
1587 Davidson, George . . .	Jan'y 19, 1866,	San Francisco, Cal
1923. Dawkins, William B. .	Oct. 15, 1880,	Manchester, England
1468. Dawson, John W	April 18, 1862,	Montreal, Canada.
2131. Delgado, Juan de Dias de la Rada y	Dec. 17, 1886,	Madrid, Spain.
2018. Dickson, Samuel	April 18, 1884,	Philadelphia.
2228. Dixon, Samuel G. . . .	Dec. 16, 18[illegible],	"
2135. Dolley, Charles S. . . .	Dec. 17, 1886,	"
2090. Donner, Otto. . . .	May 21, 1886,	Helsingfors, Finland
1945. Doolittle, C. L. . . .	Oct. 21, 1881,	Bethlehem, Pa.
1859, Douglas, James, Jr. . . .	April 20, 1877,	Spuytenduyvil, N Y.
1924. Draper, Daniel	Oct. 15, 1880,	New York, N. Y
2080. Drexel, A. J	Feb'y 19, 1882,	Philadelphia.
1787. Drown, Thomas M	July 16, 1875,	Boston, Mass.
1916. Du Bois, Patterson	Oct. 15, 1880,	Philadelphia.
1878. Dudley, Charles Benjamin .	Jan'y 17, 1878,	Altoona, Pa.
1921. Dudley, Thomas H	Oct. 15, 1880,	Camden, N. J.
2062. Duncan, Louis . . .	Feb'y 18, 1888,	U S. Navy.

Name.	Date of Election.	Present Address.
[illegible], Dercum, Francis X.	Dec. 16, 1892,	Philadelphia.

	Name.	*Date of Election.*	*Present Address*
1575.	Dunning, George F.	Jan'y 18, 1867,	Farmington, Conn.
1787.	Dupont, Edouard	April 18, 1873,	Brussels, Belgium.
[illegible].	Duruy, Victor	May 21, 18[illegible],	Paris, France.
1679.	Dutton, Clarence E. . . .	Jan'y [illegible], 1871,	Washington, D. C.

E

21[illegible].	Easton, Morton W.	Dec. 17, 18[illegible],	Philadelphia.
1917.	Eckfeldt, Jacob B	Oct. 15, 1880,	"
18[illegible].	Eddy, Henry T.	Feb'y 2, 1877,	Terre Haute, Ind
16[illegible].	Eliot, Charles W . .	April 21, 1871,	Cambridge, Mass.
1951.	Emmons, S. F	Jan'y 19, 18[illegible],	Washington, D. C.
19[illegible].	Evans, John	Oct. 21, 18[illegible],	Hemel Hempstead, Eng

F

2150.	Field, Robert Patterson .	May 16, 18[illegible],	Philadelphia.
1901.	Flint, Austin, Jr	April 16, 1880,	New York, N. Y
1601.	Flower, Wm. Henry . .	Jan'y 15, 1869,	London, England.
1675.	Fossa, Edward A. . .	Oct. 18, 1879,	Philadelphia.
2157	Forbes, George	Oct. 16, 1891,	London, England.
1170.	Fraley, Frederick . .	July 15, 1842,	Philadelphia
1912.	Fraley, Joseph C.	April 16, 1880,	"
16[illegible].	Fraser, Persifor . . .	Jan'y 19, 1872,	"
2171.	Frishmuth, George	Dec. 29, 18[illegible],	"
1609.	Froude, J. A.	Jan'y 17, 1868,	London, England.
2179	Fullerton, George S. . .	May 16, 1890,	Philadelphia.
1789.	Fulton, John.	April 18, 1878,	Johnstown, Pa.
1914.	Furness, Horace Howard .	April 16, 1880,	Philadelphia.
1130.	Furness, William H .	April 17, 1846,	"

G

1[illegible].	Garrett, Philip C	April 20, 18[illegible],	Philadelphia.
2079.	Gates, M. E	May 21, 18[illegible],	Amherst, Mass.
1665.	Gatschet, Albert S. . . .	Oct. 17, 1884,	Washington, D. C.
1897.	Geikie, Archibald	Jan'y 16, 1880,	London, England.
1802.	Geikie, James	April 21, 1876,	Edinburgh, Scotland.
1[illegible].	Genth, Fred. Augustus .	Jan'y 20, 1854,	Philadelphia.
2047.	Genth, F. A., Jr.	Feb'y 19, 18[illegible],	"
1[illegible].	Gibbs, Oliver Wolcott .	July 21, 1854,	Cambridge, Mass.
1667.	Gill, Theodore Nicholas .	July 19, 1867,	Washington, D. C.
1800.	Gilman, Daniel C.	April 21, 1876,	Baltimore, Md.
1940.	*Giraldes, J. P. C. Casado de.* . .	July 20, 1827.	
1360.	Gladstone, Wm. Ewart . . .	Oct. 21, 1861,	London, England.
2142.	Goode, G. Brown	Oct. 18, 1889,	Washington, D. C
1855.	Goodell, William	Feb'y 2, 1877,	Philadelphia.
1660.	Goodfellow, Edward. . .	Jan'y 20, 1871,	Washington, D. C.
[illegible].	Goodwin, Harold . . .	May 20, 18[illegible],	Philadelphia.
1271.	Gould, Benj. Apthorpe	Jan'y 17, 1851,	Cambridge, Mass.
1801.	Gray, Elisha.	Jan'y 14, 1876,	Chicago, Ill.
16[illegible].	Green, Traill	Oct. 16, 18[illegible],	Easton, Pa.
1[illegible].	Green, William Henry	April 17, 18[illegible],	Princeton, N. J
18[illegible].	Greene, William H.	April 18, 1879,	Philadelphia.
2155.	Gregorio, Il Marchese Antonio de	Dec. 21, 18[illegible],	Palermo, Italy

Name.	*Date of Election.*	*Present Address.*
2130. GREGORY, HENRY D.	May 17, 1889,	Philadelphia.
2186. GREGORY, CASPAR RENÉ	May 15, 1891,	Leipzig
1032. *Grimaldi, Conte*	Oct. 16, 1846,	*Naples, Italy.*
1939. GUMMERE, WM. WOOLSTON	April 16, 1880,	Haverford, Pa.
1815. GROTE, AUGUSTUS RADCLIFFE . .	Oct. 20, 1876.	
2090. GUBERNATIS, ANGELO DE . . .	May 21, 1886,	Florence, Italy
1498. *Gayangos, Pascual de.* . . .	April 19, 1861,	*Madrid, Spain.*

H

2094. HAECKEL, ERNST . . .	Oct. 15, 1886,	Jena, Prussia.
2065. HAGEN, H. A.	Feb'y 19, 1886,	Cambridge, Mass.
1656. HALE, EDW EVERETT	Jan'y 21, 1870,	Roxbury, Mass.
1700. HALE, HORATIO .	Oct. 18, 1872,	Clinton, Canada.
1652. HALL, ASAPH	Jan'y 18, 1878,	Washington, D. C.
1795. HALL, CHARLES EDWARD	Oct. 15, 1875,	Westport, N Y
1358. HALL, JAMES	July 21, 1854,	Albany, N. Y
2037. HALL, LYMAN B . . .	Jan'y 16, 1885,	Haverford, Pa.
1412. HAMMOND, WILLIAM A .	Oct. 21, 1859,	New York, N Y.
2194. HAMY, E. T	May 15 1891,	Paris, France
1367. HARDING, GEORGE . . .	Jan'y 20, 1854,	Philadelphia.
2136. HARRIS, JOSEPH S.	May 20, 1887,	"
1827. HART, JAMES MORGAN. . . .	Feb'y 2, 1877,	Ithaca, N. Y.
1349. HARTSHORNE, HENRY .	July 17, 1868,	Philadelphia.
1754. HAUER, FRANZ RITTER VON	Oct. 16, 1874,	Vienna, Austria.
1651. HAUPT, HERMANN. . . .	April 21, 1871,	St. Paul, Minn
1802. HAUPT, LEWIS M.	May 5, 1876,	Philadelphia
2082. HAYES, R. SOMERS. . .	May 21, 1886,	New York, N Y
2071. HAYS, I. MINIS	Feb'y 19, 1886,	Philadelphia.
2168. HAZLEHURST, HENRY . .	Oct. 18, 1889,	"
1985. HEILPRIN, ANGELO . .	April 20, 1883,	"
1794. HELMHOLTZ, HEINRICH .	April 14, 1876,	Berlin, Prussia.
1968. HILL, HAMILTON ANDREWS . . .	April 21, 1882,	Boston, Mass.
2130. HILPRECHT, HERMANN V. . . .	Dec. 17, 1886,	Philadelphia.
1763. HIMES, CHARLES FRANCIS . . .	Oct 16, 1874,	Carlisle, Pa.
1668. HITCHCOCK, CHARLES HENRY	April 15, 1870,	Hanover, N H.
2160. HOFFMAN, WALTER J . . .	Oct 18, 1889,	Washington, D. C.
2068. HOLLAND, JAMES W. . .	Feb'y 19, 1886,	Philadelphia.
1855. HOLMES, OLIVER WENDELL . . .	Jan'y 15, 1880,	Boston, Mass
1626. HOOKER, JOSEPH D. .	Jan'y 15, 1869,	London, England.
1884. HOPPER, EDWARD .	Oct. 15, 1880,	Philadelphia.
1697. HORN, GEORGE HENRY .	Oct. 16, 1869,	"
2070. HORNER, INMAN. . .	Feb'y 19, 1886,	"
1961. HOTCHKISS, JEDEDIAH.	Oct. 21, 1881,	Staunton, Va.
1694. HOUGH, GEORGE W.	Jan'y 19, 1872,	Chicago, Ill.
1692. HOUSTON, EDWIN J	Jan'y 19, 1872,	Philadelphia.
2143. HOUSTON, HENRY H	May 20, 1887,	"
2084. HOVELACQUE, ABEL .	May 21, 1886,	Paris, France.
1843. HUMPHREY, H. C .	July 20, 1877,	
2211. HUMPHREYS, JAMES ELLIS . . .	Dec. 16, 1892,	Amherst, Mass.
1625. HUXLEY, THOMAS HENRY .	Jan'y 15, 1869,	London, England.
1498. HYRTL, JOSEPH	July 20, 1860,	Vienna, Austria.

I

2092. IM THURN, EVERARD F.	Oct. 15, 1886,	Georgetown, British Guiana.
1773. INGHAM, WM. ARMSTRONG. . . .	April 16, 1875,	Philadelphia.

J

Name.	*Date of Election.*	*Present Address.*
2046. JAMES, EDMUND J.	April 18, 1884,	Philadelphia.
1888. JANNET, CLAUDIO	April 15, 1881,	Paris, France.
2049. JAYNE, HORACE	Oct. 16, 1885,	Philadelphia.
1954. JEFFERIS, WILLIAM W	Jan'y 20, 1882,	"
1942. JONES, CHARLES C., JR.	Oct. 21, 1880,	Augusta, Ga.
2017. JORDAN, FRANCIS, JR.	April 18, 1884,	Philadelphia.

K

1969. KANE, ELISHA KENT . .	April 20, 1888,	Kane, Pa.
2199. KEANE, JOHN J	Dec. 20, 1889,	Washington, D. C.
1048. KEATING, WILLIAM V	April 21, 1854,	Philadelphia.
2021. KEEN, WILLIAM W .	July 18, 1884,	"
1982. KEIM, GEO. DE BENNEVILLE .	April 21, 1882,	"
2118. KIEPERT, HEINRICH	Dec. 17, 1886,	Berlin, Prussia.
1161. KENDALL, E. OTIS	Jan'y 21, 1842,	Philadelphia.
1703. KING, CLARENCE	Oct. 18, 1872,	New York, N. Y
1234. KIRKWOOD, DANIEL . . .	April 18, 1851,	Riverside, Cal.
1767. KÖNIG, GEORGE A . .	Oct. 16, 1874,	Houghton, Mich.
2167 KRAUSS, FRIEDERICH S . . .	Dec. 20, 1889,	Vienna, Austria.

L

1036. *Labouderie, J.*	April 19, 1833,	*Paris, France.*
1694. LAMBERT, GUILLAUME	Jan'y 19, 1872,	Louvain, Belgium.
1858. LANDRETH, BURNET . . .	Jan'y 18, 1878,	Bristol, Pa.
1781. LANGLEY, SAMUEL P	April 16, 1875,	Washington, D. C.
1721. LA ROCHE, C. PERCY . . .	Jan'y 17, 1873,	Rome, Italy
1711. LAUTH, FRANZ JOSEPH . .	Oct. 18, 1872,	Munich, Bavaria.
1974. LAWES, JOHN BENNETT .	Jan'y 19, 1883,	Rothamstead, Herts, Eng.
1563. LEA, HENRY CHARLES . . .	Oct. 18, 1867,	Philadelphia.
1737 LE CONTE, JOSEPH . .	April 18, 1873,	Berkeley, Cal.
2126. LEEMANS, CONRAD . . .	Dec 17, 1886,	Leyden, Holland.
1926. LEHMAN, AMBROSE E.	April 20, 1888,	Philadelphia.
2182. LELAND, CHARLES G.	May 16, 1890,	London, Eng.
2174. LE MOINE, J M. . .	Dec. 20, 1889,	Quebec. Canada.
1984. LE ROY-BEAULIEU, PAUL . .	April 18, 1884,	Paris, France.
1252. LESLEY, J. PETER	July 18, 1856,	Philadelphia.
1278. LETCHWORTH, ALBERT S. .	Jan'y 18, 1856,	"
2055. LEVASSEUR, EMILE	May 21, 1886,	Paris, France.
1418. LEWIS, FRANCIS W . . .	Jan'y 20, 1860,	Philadelphia.
1238. *Leyburn, John.*	July 18, 1856,	Baltimore, Md
1766. LOCKYER, JOSEPH NORMAN. . . .	April 17, 1874,	London, England.
2202. LOW, SETH	Feb. 19, 1892,	New York, N. Y
1872. LONGSTRETH, MORRIS	Sept. 20, 1878,	Philadelphia.
1015. *Loria, Theodore*	April 20, 1832,	*Paris, France*
2012. LUBBOCK, JOHN	July 18, 1884,	London, England.
2023. LUDLOW, WILLIAM	Jan'y 18, 1884,	U. S. A.
1629. LYMAN, BENJAMIN SMITH . . .	Jan'y 18, 1869,	Philadelphia.

M

1058. *Macedo, J. L. DaCosta*	April 18, 1828,	*Lisbon, Portugal.*
2209. MACFARLANE, JOHN M.	Dec. 16, 1892,	Lansdowne, Pa.
1994. MAISCH, JOHN M.	Jan'y 18, 1884,	Philadelphia.
1970. MALLERY, GARRICK, JR .	Oct. 20, 1882,	Washington, D. C
2042. MALLET, JOHN WM.	Jan'y 16, 1885,	University of Virginia, Va

	Name.	Date of Election.	Present Address.
1[illegible]7.	Mansfield, Ira Franklin . . .	Jan'y 18, 1878,	Cannelton, Pa.
1[illegible]7.	March, Francis Andrew . .	Jan'y 18, 1878,	Easton, Pa.
1861.	Marks, William D. . .	May 2, 1878,	Philadelphia.
1604.	Marsh, Othniel C	Oct. 16, 1868,	New Haven, Conn.
2[illegible]	Marshall, John	May 21, 1886,	Philadelphia.
1018.	*Martinez, Juan José*	April 20, 18[illegible],	*Spain.*
2[illegible].	Mascart, E.	Dec. 19, 1890,	Paris, France
1572.	Mason, Andrew	Jan'y 18, 1867,	New York, N Y
2[illegible].	Maspero, Gaston	May 15, 1891,	Paris, France
1[illegible]4.	Mayer, Alfred M . . .	Oct. 15, 1869,	Hoboken, N J
2157	McAlister, James	Dec. 17, 1886,	Philadelphia.
19[illegible]	McCauley, Edward Y . .	Jan'y 21, 1881,	"
1[illegible].	McCosh, James . . .	April 21, 1871	
1[illegible].	McCreath, Andrew S. . .	July 18, 1879,	Harrisburg, Pa.
1681.	McKean, William V . .	Feb'y 2, 1877,	Philadelphia
2004.	McMaster, John Bach .	Jan'y 18, 1884,	"
1677.	Meehan, Thomas . .	Jan'y 20, 1871,	"
1808	Merrick, John Vaughan . .	April 16, 1880,	"
1947.	Merriman, Mansfield . . .	Oct. 21, 1881,	Bethlehem, Pa.
1744.	Messchert, Mathew Huizinga.	Oct. 17, 1873,	Douglassville, Pa.
2142.	Michael, Helen Abbott . . .	May 20, 1887,	Philadelphia.
2175.	Mitchell, James T .	Feb'y 21, 1890,	"
1461.	Mitchell, S. Weir . . .	Jan'y 17, 1862,	"
2114.	Monier-Williams, Monier . .	Dec. 17, 1886,	London, England.
1794.	Moore, Gideon E . .	Oct 15, 1875,	New York, N Y.
2[illegible].	Moore, James W . .	Jan'y 15, 1886,	Easton, Pa.
1841.	Morehouse, George R . .	April 20, 1877,	Philadelphia.
1054.	*Morelli*	Jan'y 15, 18[illegible],	*Naples, Italy.*
1[illegible].	Morris, J Cheston	Jan'y 19, 1863,	Philadelphia.
1577	Morton, Henry . .	Jan'y 18, 1867,	Hoboken, N J
2121	Much, Matthaeus . . .	Dec. 17, 1886,	Vienna, Austria.
1[illegible]	Mühlenberg F. A.	Sept. 20, 1878,	Greenville, Pa.
2[illegible].	Mueller, Friedrich . . .	Dec. 17, 1886,	Vienna, Austria
16[illegible].	Mueller, F Max. . .	Jan'y 15, 1869,	Oxford, England
2192.	Munroe, Charles E. . . .	May 15, 1891,	Washington, D. C
1[illegible].	Muoni, Damiano	Jan'y 16, 1880,	Milan, Italy
2062.	Murdock, J B.	Feb'y 19, 1886,	U. S. Navy
1[illegible]7	Murray, James A H . .	April 15, 1881,	Oxford, England

N

2087	Nadaillac, Marquis de	May 21, 1888,	Paris, France
1[illegible].	Newcomb, Simon	Jan'y 18, 1878,	Washington, D C
1[illegible].	Newton, Hubert Anson . .	April 16, 1869,	New Haven, Conn
1709	Nichols, Starr Hoyt . .	July 19, 1872,	New York, N Y
2048.	Nikitin, Sergei .	Feb'y 19, 1886,	St. Petersburg, Russia.
1[illegible].	Nordenskiold, Adolf Eric	April 21, 1876,	Stockholm, Sweden
1712.	Norris, Isaac. .	Oct. 18, 1872,	Philadelphia
2106.	Norris, William F. .	Dec. 17, 1886,	"
2046.	North, Edward. . . .	Oct. 16, 1885,	Clinton, N Y

O

2072.	Oliver, Charles A	Feb'y 19, 1886,	Philadelphia.
1715.	Oliver, James E. . .	Jan'y 17, 1873,	Ithaca, N. Y
2195.	Oppert, Jules	May 15, 1891,	Paris, France
2128.	Osborn, Henry F. . . .	Feb'y 18, 1887,	Princeton, N J.
1581.	Osborn, Henry S. . . .	Jan'y 18, 1867,	Oxford, O.
2[illegible].	Osler, William	Jan'y 16, 1885,	Baltimore, Md.
1[illegible].	Owen, P. Cunliffe .	April 21, 1876,	London, England.

P

	Name.	*Date of Election.*	*Present Address.*
[illegible].	PACKARD, A. S., JR.	Sept. 20, 1878,	Providence, R. I.
1572.	PACKARD, JOHN H.	Jan'y 18, 1867,	Philadelphia.
1[illegible]	PAGET, JAMES	Jan'y 20, 1854,	London, England.
1[illegible].	PANCOAST, WILLIAM HENRY	Jan'y 19, 1859,	Philadelphia.
1672.	PARIEU, ESQUIROU DE , . .	Jan'y 20, 1871,	Paris, France.
[illegible].	PARVIN, THEOPHILUS . . .	Jan'y 16, 1885,	Philadelphia.
[illegible].	PASTEUR, LOUIS	Oct. 16, 1885,	Paris, France.
[illegible].	PATTERSON, C. STUART .	Jan'y 16, 1885,	Philadelphia.
1[illegible].	PATTERSON, ROBERT	April 18, 1851,	"
1[illegible].	PATTERSON, THOMAS L.	April 15, 1859,	Cumberland, Md.
1772.	PEARSE, JOHN B.	Jan'y 15, 1875.	Boston, Mass.
1[illegible].	PEIRCE, C. NEWLIN .	May 3, 1878,	Philadelphia.
1762.	PEMBERTON, HENRY	Jan'y 17, 1874,	"
[illegible].	PEÑAFIEL, ANTONIO . .	May 21, 1886,	Mexico
[illegible]	PENNYPACKER, SAMUEL W .	May 21, 1886,	Philadelphia.
1818.	PENROSE, R. A. F . .	July 17, 1857,	"
2089.	PEPPER, EDWARD	Feb'y 19, 1886,	Paris.
1[illegible]	PEPPER, WILLIAM . .	July 15, 1870,	Philadelphia.
[illegible]1.	*Pereira, José Maria Dantas*. . .	April 18, 1828,	*Lisbon, Portugal*
1705.	PETER, ROBERT	July 19, 1872,	Lexington, Ky
1[illegible]	PHILLIPS, HENRY, JR . .	Feb'y 2, 1877,	Philadelphia.
1760.	PLATT, FRANKLIN . .	July 17, 1874,	"
2[illegible]7	PLATZMANN, JULIUS .	Dec. 17, 1886,	Leipzig, Germany
[illegible].	PODBIELOWSKY, JOHN . .	Oct. 16, 1885,	St. Petersburg, Russia
1[illegible]	PORTER, THOMAS CONRAD , .	Oct. 21, 1864,	Easton, Pa.
[illegible]	POTTS, JOSEPH D. . . .	May 20, 1892,	Philadelphia.
[illegible].	POTTS, WILLIAM JOHN . . .	Oct. 16, 1886,	Camden, N. J
[illegible]7.	POSTGATE, J P .	May 21, 1886,	Cambridge, England
[illegible].	POWELL, J. W.	Oct. 18, 1889,	Washington, D. C.
1619.	PRESTWICH, JOSEPH . . .	Jan'y 15, 1869,	Shoreham, England
1[illegible].	PRIOR, J. SERGEANT	Oct. 18, 1867	Philadelphia.
17[illegible].	PRIME, FREDERICK, JR . . .	April 16, 1875,	"
[illegible].	PULSZKY, FRANCIS , ,	May 27, 1885,	Buda-Pesth, Hungary
17[illegible].	PUMPELLY, RAPHAEL . .	April 17, 1874,	Newport, R. I

Q

972.	*Quadrado, Francisco de Paula*	Oct. 16, 1829,	*Madrid, Spain*
1143	*Quaranta, Bernardo*. .	Jan'y 15, 1841,	*Naples, Italy.*

R

170[illegible].	RAND, THEODORE D .	April 19, 1873,	Philadelphia.
1[illegible].	RANDALL, F. A. . .	Jan'y 18, 1878,	Warren, Pa.
1644.	RAWLINSON, GEORGE	Oct. 15, 1869.	Oxford, England.
17[illegible].	RAWSON, RAWSON W . .	Oct. 16, 1874,	London, "
[illegible].	RAYLEIGH, LORD	May 21, 1886.	Essex, England
17[illegible].	RAYMOND, ROSSITER W	April 16, 1875,	New York, N. Y.
1[illegible].	RAYNOLDS, WILLIAM F	April 19, 1867,	Detroit, Mich.
1[illegible].	READ, JOHN MEREDITH .	July 19, 1867,	
[illegible]7.	REED, HENRY	May 21, 1886,	Philadelphia.
1[illegible]	REMSEN, IRA, . .	July 18, 1879,	Baltimore, Md.
[illegible].	RENARD, A	Oct. 21, 1881,	Brussels, Belgium.
1[illegible].	RENARD, CHARLES	Jan'y 20, 1854,	Moscow, Russia.
1[illegible].	RENEVIER, E.	July 18, 1879,	Lausanne, Switzerland.

Name.	*Date of Election.*	*Present Address.*
1854. Reuleaux, F.	Feb'y 2, 1877,	Berlin, Prussia.
2122. Réville, Albert	Dec. 17, 1886,	Paris, France.
1599. Richardson, Benj. Ward . . .	April 17, 1868,	London, England.
1596. Riley, Charles V	April 21, 1876,	Washington, D. C.
1937. Robins, James W	April 21, 1882,	Philadelphia.
1360. Rogers, Fairman, ...	Jan'y 16, 1857,	Newport, R. I.
2177. Rogers, Robert W	Feb'y 21, 1890,	Carlisle, Pa.
1906. Rogers, William B., Jr. .	April 16, 1880,	Philadelphia.
1469. Römer, F. L. O.	April 18, 1862,	Los Angeles, Cal.
2082. Rollett, Hermann	Oct. 16, 1885,	Vienna, Austria.
1907. Rood, Ogden N	April 16, 1880,	New York, N. Y.
1964. Rosny, de, Léon	July 21, 1882,	Paris, France.
1782. Rossi, Giovanni Battista . .	April 16, 1875,	Rome, Italy.
2198. Rosengarten, Joseph G	Oct. 16, 1891,	Philadelphia.
1716. Rothermel, Peter F.	Jan'y 17, 1873,	Limerick P. O., Pa.
1855. Rothrock, Joseph T. . .	April 20, 1877,	Philadelphia.
1064. Ruschenberger, Wm. S. W. .	Oct. 19, 1842,	"
1636. Rütimeyer, Carl L.	Jan'y 15, 1869,	Basel, Switzerland.
2109. Ryder, John A	Dec. 17, 1886,	Philadelphia.

S

1769. Sadtler, Samuel Philip . .	Oct. 16, 1874,	Philadelphia.
2149. Sajous, Charles E.	Feb'y 17, 1888,	Paris, France.
1589. Sandberger, Fridolin	April 20, 1866,	Würzburg, Bavaria.
1953. Sargent, Charles Sprague	April 21, 1882,	Brookline, Mass.
1735. Saussure, Henri de	April 18, 1873,	Geneva, Switzerland.
1877. Schorlemmer, C	Oct. 18, 1878,	Manchester, England.
1466. Schott, Charles Anthony	April 17, 1862,	Washington, D. C.
1884. Schurz, Carl	Sept. 20, 1878.	
1725. Sclater, Phillip Lutley	April 18, 1873,	London, England.
1919. Scott, Lewis A.	Oct. 15, 1880,	Philadelphia.
2112. Scott, W. B.	Dec. 17, 1886,	Princeton, N. J.
1879. Scudder, Samuel Hubbard	Sept. 20, 1878,	Cambridge, Mass.
1884. Seidensticker, Oswald . .	Jan'y 21, 1879,	Philadelphia.
1889. Seiler, Carl .	April 18, 1879,	"
1704. Sellers, Coleman	July 19, 1872,	"
1532. Sellers, William . .	April 15, 1864,	"
1778. Selwyn, Alfred R. C. . .	Oct. 16, 1874,	Montreal, Canada.
1723. Selys, de, Longchamps	April 18, 1873,	Liége, Belgium.
2087. Sergi, Giuseppe . .	Oct. 16, 1885,	Rome, Italy.
1965. Sève de Bar, Edouard	July 21, 1882,	Ramsgate, England.
2076. Sharp, Benjamin	May 21, 1886,	Philadelphia.
1944. Sharpless, Philip Price .	Oct. 21, 1881,	West Chester, Pa.
1950. Sharples, Stephen Paschall	April 21, 1882,	Boston, Mass.
2002. Sharpless, Isaac	Jan'y 18, 1884,	Haverford, Pa.
1792. Sheppard, Furman	Oct. 15, 1875,	Philadelphia.
1787. Sherwood, Andrew	Oct. 15, 1875,	Mansfield, Pa.
1852. Shields, Charles W . . .	Feb'y 2, 1877,	Princeton, N. J.
1562. *[illegible], Carl* . .	April 15, 1864,	*Strasburg, Germany* (?)
2148. Smith, Edgar F. .	Oct. 21, 1887,	Philadelphia.
1544. Smith, Goldwin	Jan'y 20, 1865.	
1798. Smith, Stephen . .	Oct. 16, 1874,	New York, N. Y.
2241. Smyth, Albert H	May 20, 1887,	Philadelphia.
1742. Snowden, A. Loudon . .	Oct. 17, 1873,	"
2009. Snyder, Monroe B. . .	Jan'y 18, 1884,	"
2030. Spangler, Henry W . . .	May 16, 1884,	"

Name	Date of Election		Present Address
1730. Spofford, A. R.	Jan'y	17, 1873,	Washington, D C
1949. Stallo, John B.	Oct.	21, 1881,	Cincinnati, O
1446. Steenstrup, J. J. S.	Jan'y	17, 1862,	Copenhagen, Denmark
1990. Stevens, Walter LeConte	Jan'y	18, 1884,	Troy, N Y
1840. Stevenson, John James	April	20, 1877,	New York, N Y
2168. Stokes, George G.	Dec	20, 1889,	London, England
1834. Strawbridge, George	Feb'y	2, 1877,	Philadelphia.
1558. Strong, William	Jan'y	19, 1866,	Washington, D C.
1831. Stuart, George	Feb'y	2, 1877,	Philadelphia.
2181. Stubbs, William	May	15, 1891,	Oxford, England.
2088. Stur, Dionys	May	21, 1886,	Vienna, Austria
2094. Suess, Edward	May	21, 1886,	" "
2022. Syle, L W	July	18, 1884,	Philadelphia.
1844. Sylvester, J. J.	July	20, 1877,	Oxford England
2082. Szombathy, Josef,	May	21, 1886,	Vienna, Austria

T

1765. Tatham, William P	April	16, 1875,	Philadelphia
1846. Taylor William B	Oct	19, 1877,	Washington, D. C
2096. Temple, Richard Carnac	May	21, 1886,	Upper Burmah, India
2006 Thomas, Allen C	Jan'y	18, 1884,	Haverford, Pa.
1807 Thomson, Elihu	April	21, 1876,	Swampscott, Mass.
1983. Thompson, Heber S.	Jan'y	18, 1884,	Pottsville, Pa.
1728. Thompson, Henry	April	18, 1873,	London, England
1756. Thompson, Robert Ellis	April	17, 1874,	Philadelphia
1754. Thomson, Frank	April	17, 1874,	"
1729 Thomson, William	April	18, 1873,	London, England.
1909. Thomson, William	April	16, 1880,	Philadelphia.
1580. Thury, A	April	15, 1864,	Geneva, Switzerland
1686. Tilghman, Benjamin C	July	21, 1871,	Philadelphia.
1289. Tilghman, Richard A.	April	16, 1847,	"
1657. Tilghman, William M.	Jan'y	21, 1870,	"
2178. Timmins, Samuel	Feb	21, 1890,	Arley, near Coventry, Eng
2123. Topinard, Paul	Dec	17, 1886,	Paris, France.
2085. Toppan, Robert Noxon.	Feb'y	19, 1886,	Cambridge, Mass
1567. Townsend, Joseph B	Jan'y	17, 1868,	Philadelphia.
1355. Townsend, Washington	Jan'y	20, 1852,	West Chester, Pa
1691. Trowbridge, William P.	Jan'y	19, 1872,	New York, N Y
2031. Trumbull, Henry Clay	July	18, 1884,	Philadelphia.
1978. Tschermak, Gustav	Oct.	20, 1882,	Vienna, Austria
1962. Turrettini, Theodore	Dec	16, 1881,	Geneva, Switzerland.
2188. Tuttle, David K	Oct.	18, 1890	Philadelphia
2168. Tyler, Lyon G	Oct.	18, 1889,	Williamsburg, Va.
1580. Tunner, Peter	April	15, 1864,	Leoben, Austria.
1608. Tyndall, John	April	17, 1868,	London, England
2105. Tyson, James	May	20, 1887,	Philadelphia

U

2185. Unwin, William C.	Dec.	19, 1890,	London, England.

V

2008. Vaux, Richard	Jan'y	18, 1884,	Philadelphia.
2146. Vere, De, Schele M.	Oct.	16, 1888,	University of Virginia, Va.
1478. Virchow, Rudolph.	Oct.	17, 1862,	Berlin, Prussia.
1648. Vogt, Carl	Oct	15, 1869,	Geneva, Switzerland
2132. Von Meltzl, Hugo	Dec.	17, 1886,	Kolozsvar, Hungary
1670. Vose, George Leonard.	Oct.	21, 1870,	Boston, Mass.
2186. Vossion, Louis	Dec.	19, 1890,	Philadelphia.

W

Name.	Date of Election.	Present Address.
[illegible]. Wagner, Samuel	Jan'y 16, [illegible],	Philadelphia.
17[illegible]. Wahl, William H.	Jan'y 16, 1874,	"
17[illegible]. Wallace, Alfred R.	April 18, 1873,	Parkstone, Dorset, England.
2[illegible]. Ward, Lester F.	May 17, [illegible],	Washington, D. C
[illegible]. Weil, Edward Henry . .	Jan'y 16, [illegible],	Philadelphia.
[illegible]. Weisbach, Albin	Jan'y 16, [illegible],	Freiburg, Saxony
[illegible]. Wharton, Joseph	April 16, [illegible],	Philadelphia.
1[illegible]. White, Andrew D.	April 16, [illegible],	Ithaca, N. Y.
1[illegible]. White, Israel C.	Jan'y 18, 1878,	Morgantown, W. Va.
1[illegible]. Whitney, Josiah Dwight .	Jan'y 16, [illegible],	Cambridge, Mass
1[illegible]. Whitney, William Dwight . .	April 17, [illegible],	New Haven, Conn.
1[illegible]. Wilder, Burt Green	May 3, 1878,	Ithaca, N Y
2[illegible]1. Williams, Talcott	May 18, [illegible],	Philadelphia
[illegible]. Willis, Henry	Feb'y 21, [illegible],	"
[illegible]. Wilson, Edmund B. . . .	Feb'y 17, [illegible],	Bryn Mawr, Pa.
[illegible]. Wilson, James C.	Jan'y 16, [illegible],	Philadelphia.
1747. Wilson, Joseph M.	Jan'y 16, [illegible],	"
21[illegible]. Wilson, William Powell . .	May 20, 1887,	"
1[illegible]. Winthrop, Robert C. . . .	Jan'y 18, [illegible],	Boston, Mass.
2140. [illegible], [illegible] D.	May 20, 1887	Philadelphia.
1[illegible]. Wister, Owen Jones . . .	April 20, [illegible],	"
18[illegible]. Wood, Richard	April 18, 1879,	"
1782. Woodward, Henry . . .	July 17, 1874,	London, England
1791. Wootten, J. E.	Jan'y 16, 1874,	Reading, Pa
18[illegible]. Wormley, Theodore G. .	Jan'y 18, 1878,	Philadelphia
1[illegible]. Wurts, Charles Stewart .	Jan'y 21, [illegible],	"
2[illegible]. Wyckoff, A. B.	Feb'y 19, [illegible],	U. S. Navy

Y

1904. Yarnall, Ellis	April 16, [illegible],	Philadelphia
17[illegible]. Young, Charles Augustus . .	April 17, 1874,	Princeton, N. J.